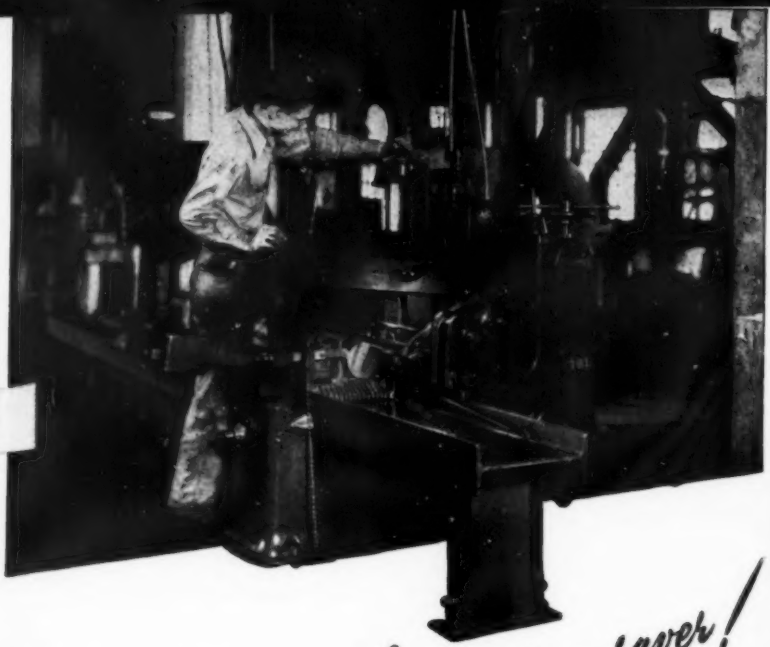
MACHINE TOOL

Blue Book

MAY 1941

FRAY ALL ANGLE

FRAY MACHINE TOOL COMPANY
Glendale, California, U. S. A.



A great time saver!
for the Sidney Machine Co.

• After 6 months of continuous high speed cutting-off (from S.A.E. 4150 bars heat treated to 28 Rockwell S.A.E. 4150 annealed, and S.A.E. 1335), Mr. L. S. Kirby, Superintendent of the Sidney Machine Tool Co., Sidney, Ohio, reports that his new MARVEL 9A has "given completely satisfactory service and proven to be highly efficient and a great time saver."

Much faster than any other accurate method of cutting-off bar steel, these many-duty, all-ball-bearing MARVEL Production Saws are eliminating "bottle necks" in stock rooms and cutting-off departments everywhere. Requiring no more attention than an automatic screw machine, they will cut identical lengths or slices from single or nested bars "automatically" . . feed, measure, cut-off and stop at any pre-determined point.

No matter what your metal sawing problems, the MARVEL System of Metal Sawing supplies the best answer. The local MARVEL Metal Cutting engineer will upon request, study your requirement, and make recommendations as to methods and equipment.

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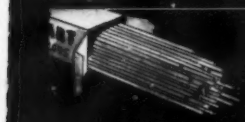

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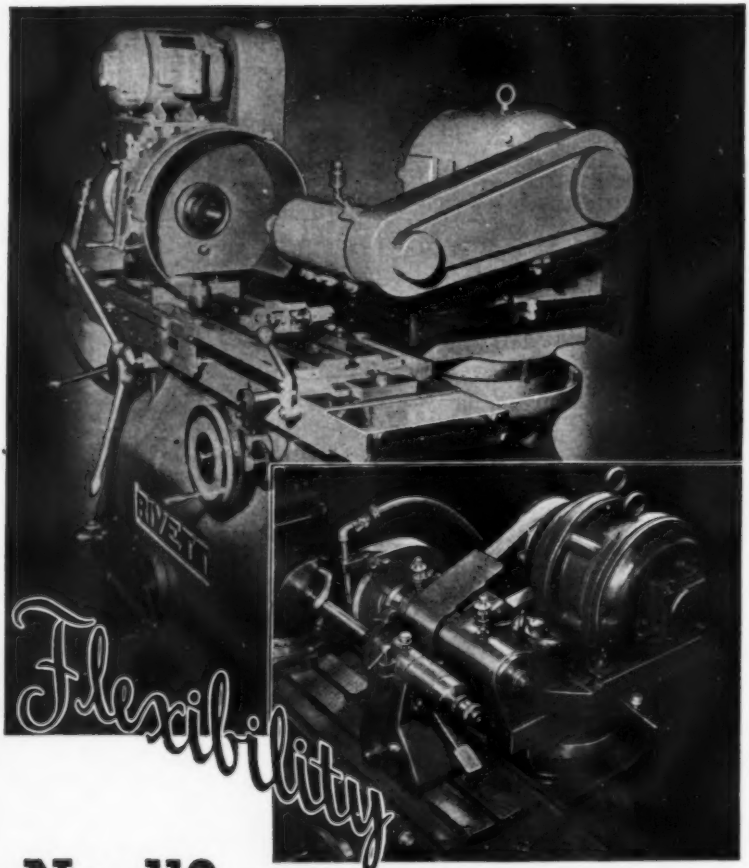

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Primarily is for medium and large internal and external tool-room grinding, straight, bevel, two angle or straight and bevel at one setting.

Send for Bulletin 112-B.

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WINCHESTER MODEL 70 BOLT ACTION REPEATING RIFLE

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the high quality, quick action and accuracy of all Winchester Arms, demanded the same characteristics in the machines used in their manufacture.

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With the *correct* ARMSTRONG TOOL HOLDER for each operation, you can machine steel efficiently and safely at cutting speeds far beyond those considered "Standard" — speeds limited only by the pulling power of the machine tool.

There are tool holders of over 200 sizes and shapes in the Armstrong System. Each is a permanent multi-purpose tool that eliminates "tool dressing" and "Saves: All Forging, 70% Grinding and 90% High Speed Steel, "that take cutters any mechanic can quickly grind from stock shapes of high speed steel.

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Buy ARMSTRONG tools from your Supply House

MACHINE TOOL BLUE BOOK

Hitchcock Publishing Co., 508 So. Dearborn St., Chicago

31,500 THIS ISSUE *MAY 1941* *VOLUME 37, No. 5*

CCA

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For machining all sizes up to 6" cases. Drilling, reaming, counterboring and facing the head end, also open end trimming to length and chamfering inside and outside — *all* performed automatically and simultaneously.

This machine is remarkably fast and will machine 5" cases in 25 seconds. Automatic loading time is from 5 to 7 seconds. Ejection is also automatic.

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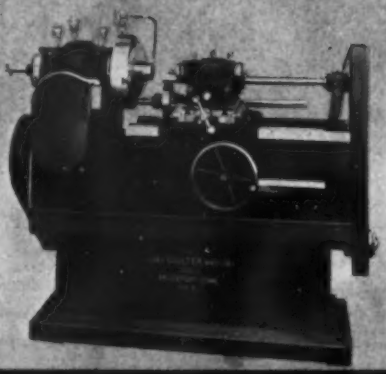

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With camshaft control for setting hob to depth on first piece only, after which duplication is assured without manual adjustments. Large milling spindle, taper bearings, direct worm and gear drive and a wide range of speeds and feeds. Length of bed, 52". Swing over carriage, 14". Maximum external thread, 7"

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No time must be lost in arming America. No time need be wasted designing and building special machines for work that can be done to better advantage on standard Jones & Lamson Turret Lathes, Fay Automatic Lathes, Comparators, Automatic Thread Grinding Machines and Automatic Opening Die Heads. Then, in future years, when this emergency is over and special machines are scrapped and written off, your Jones & Lamson equipment can be adapted easily, quickly and cheaply to earning welcome profits on production work. That's why it will pay you now and reward you later to put your production problems up to Jones & Lamson engineers.

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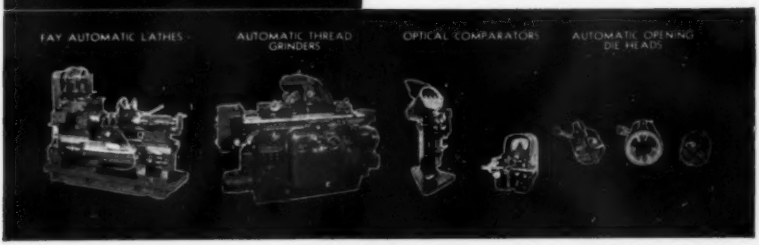
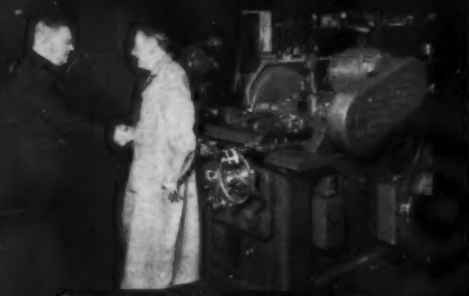


25,000th NORTON MACHINE



Congratulations on completion of 25,000th Norton Machine

[For Management: Howard W. Dunbar. For Shop: Chief Inspector Thomas S. Batter

NORTON
GRINDING MACHINES

Charles H. Norton's No. 1 Cylindrical Grinding Machine went to R. Hoe & Co., Brooklyn, in 1901—now in Edison Institute, Dearborn, Mich.

ON March 15 Norton Machine No. 25,000 came off the assembly line—bound for an airplane motor plant to play its part in the Defense Program.

Twenty-five thousand is not a large number when you think of automobiles or radios or other consumer products but in the Machine Tool Industry it is a figure to be proud of. It took many man-hours of skilled labor to produce these 25,000 Norton machines. Their operation in industry the world over has provided thousands of hours of work for thousands of men.

It was just forty years ago that Charles H. Norton's first cylindrical grinding machine revolutionized grinding, making it for the first time a production-precision machining operation instead of a light finishing operation for small parts.

NORTON COMPANY,

M-436A

Comes off Assembly Line

Production Increased 300%

Norton Grinding and Lapping Machines are now produced at a rate that is approximately four times that of 1937, the previous peak year —an increase of 300%.

Five important steps have been largely responsible for the increase: (1) Use of assembly lines, (2) Farming-out of work, (3) Making available for manufacturing purposes every possible foot of floor space, (4) Leasing an outside building, (5) An extensive well planned training system.

The assembly line has probably done most to speed production because by this method of manufacture machines are turned out with greater facility and speed.

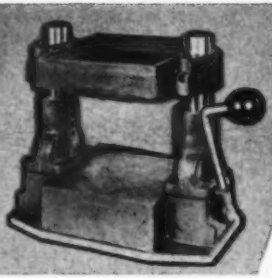
Thus, without sacrificing quality, quantity production is now an accomplished fact at Norton.

WORCESTER, MASS.

Assembly Line for 6" Type C Cylindrical Grinders

Assembly Line for 6" Surface Grinders

"U" Bench for Sub-assembly



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FOR USE ON

DEFENSE PRODUCTION

Mijit and Esco Jigs are standardized items kept in stock for quick shipment. More than 80 styles and sizes are available. Generally, one can be chosen which, with a simple adapter block will fit your purpose. They save long hours of jig and fixture design—many costly hours of toolroom work—and speed up machining operations enormously. At the upper left is shown the Esco Jig, one of the many styles available. Upper right is featured the Mijit Jig, and lower center shows the Jack Lock, a unit providing a simple adaptable locking device for large fixtures and applicable to milling machines and planer operations. All these, plus our many others, are available for immediate delivery. Why wait longer? Order yours today, or write for free information and details.

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No time now for drills that shirk!

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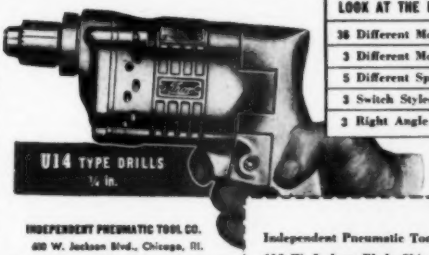
Small, Light Thor Drills Keep Production Humming!

Old time drilling methods simply can't maintain today's swift pace! No time now for sluggish hand methods! No time for obsolete, inefficient drills! Turn, instead, to the quick modern way to drill — with hard working Thor ¼ inch Portable Electric Drills! So small, light, and compact they can be operated accurately with but *one hand*. So powerful they handle the hardest production drilling with perfect ease. So complete — 36 different models — you will find precisely the correct motor size, speed, and switch style you need for every kind of drilling!

For helpful information on Thor Drills and other portable electric tools, mail the coupon for your copy of Thor Catalog No. 37.



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- 5 Different Speeds
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MIDWEST *Precision* **METAL CUTTING TOOLS**

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Grind them on a SELLERS TOOL GRINDER!

More vital than ever before is the need for correctly ground tools and tool bits—for it is only when tools are properly shaped and have the right clearance and rake that they can take heavier cuts at higher speeds for fast production work. Sellers Tool Grinders provide a simple and efficient means of accurately producing correct tool shapes and of *duplicating these shapes on any number of tools.*

To keep in step with today's production demands, you need a Sellers Tool Grinder in your plant.

Write for the new Sellers 4-T Tool Grinder Bulletin.

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Improved Tapping Head makes Remarkable Records

New "Procunier" High Speed Tapping Head Quickly Pays For Itself

In gruelling tests on actual production work—this remarkable new High-Speed Tapping Head with the exclusive "Tru-Grip" Tap Holder has broken numerous plant records for speed of tapping, accuracy and elimination of tap breakage. There are definite reasons for this: The Tru-Grip Tap Holder is so compact and light (weighs 1/3 of conventional tap holders) that fly wheel effect is reduced to a minimum. The Tapping Head offers dry, double cone friction clutch that won't wear, can't absorb oil and makes bottom tapping easy—three-point balanced heat-treated gear reversing mechanism that distributes pull and greatly reduces strain—and many other important features. Find out how this tapping head can quickly pay for itself in your shop—and solve your tapping problems!

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giving full details, description and prices on complete line of Procunier Precision Tapping Heads to meet all needs, the new Tru-Grip Tap Holder—and also the full line of Procunier Universal Tapping Machines, hand, foot or air-operated.

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Send me Bulletins on: ☐ *High Speed Tapping Heads* ☐ *Tru-Grip Tap Holders* ☐ *Universal Tapping Machines.*

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LOW COST

LOW MAINTENANCE EXPENSE

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Below is the Five Star Torq-qua-matic transmission—the low cost individual motorized unit drive for machine tool equipment.

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Backed by the full powered, sturdy, long-lived Torq electric motor—this Multi-stage, variable-speed transmission is a "Five Star" Drive.

- ★ **The installation cost is low.**
- ★ **Maintenance expense is practically negligible.**
- ★ **It increases production efficiency**—*no time wasted reaching for overhead levers.*
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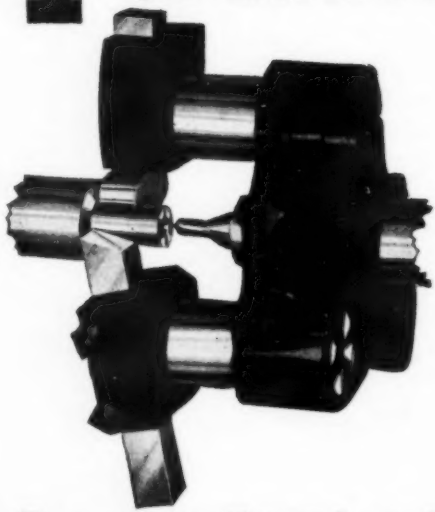
- ★ **Higher employee morale**—*it means less fatigue for operators and permits increased output.*

If you need greater production capacity—Torq-qua-matic transmissions is your answer! Actual cases show production increases of 25%. Your inquiry will receive prompt attention.

THE TORQ ELECTRIC MFG. COMPANY

TURNING and CENTERING IN 1 OPERATION



with R and L Turning Tools

This Combination Tool is the only Right and Left Hand tool on the market. Can be changed from right to left and vice versa in 10 seconds. Replaces 14 tools costing 4 times as much.

Here are some of the multiple operations that can be done with the R and L: Pointing work concentric with turned diameter; drilling and chamfering; turning and forming special shape or end of part while drilling or reaming; turning one diameter—chamfering two corners, facing end of part along with drilling or reaming; turning two diameters while drilling or reaming; turning shoulder concentric with stock diameter.

You can readily see the enormous savings in time, trouble and money that can be effected by the use of R and L Turning Tools.

Write for 44-page booklet describing all the uses of R and L.

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When your bottleneck is

LOW AIR PRESSURE—

Break it with High-Cycle! That's what we did at this foundry. Did it *quick* and at *little cost.*

Pressure down to 50 lbs. I placed a gauge in the line *at the tool* (tank gauge readings don't count with me). Pressure was only 50 lbs. when tools were running. Piece output was below par. Slow speeds made wheel life short. Cost of additional compressor—$2477 (plus cost of air tools) would have been excessive. High-Cycle was the logical answer for their Defense work needs—faster production with low investment cost.

Out of the jam for $905. Pinched for funds, and in need of immediate delivery, they bought a used frequency-changer for $425. Four new Rotor High-Cycle Grinders cost $480. Later they bought two more. They have enough power to handle four more tools if required. By now using fewer air tools, air pressure is up and they're getting higher output from them, too.

There's nothing mysterious about High-Cycle. Let me demonstrate it in your shop. No obligation. Perhaps it will break *your* bottleneck. Or perhaps modern *Air* tools would be better in your case. I'm unbiased.

THE ROTOR ANALYST

The Rotor Analyst has 65 different Air tools and 59 different High-Cycle tools with which to solve your problems.

Rotor High-Cycle tools operate faster under load—remove more metal per minute. Why? See Page 4 of the High-Cycle FACTS Book. Gratis on request.

THE ROTOR TOOL CO.

CLEVELAND, OHIO

Defense Work or Peace Work

TRADE MARK
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Symbol FVM
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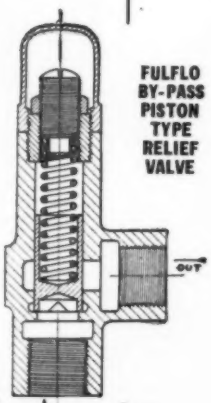
The FULFLO LINE of Coolant Pumps and Relief Valves continue to be tops in their field.

Where-ever good equipment is found, one or more of the FULFLO PRODUCTS will be serving its purpose.



FULFLO
BY-PASS
PISTON
TYPE
RELIEF
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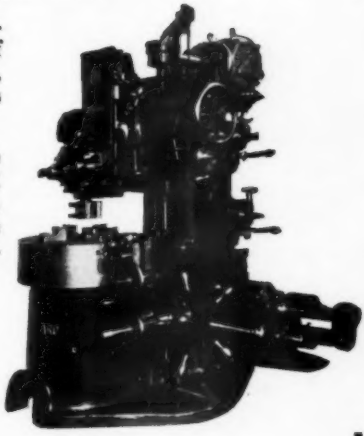
The Fulflo Specialties Co., Inc.
Blanchester, Ohio

Symbol FHM
Horizontal Type

We Rebuild Your Tools

For Accurate Work on Today's Tasks

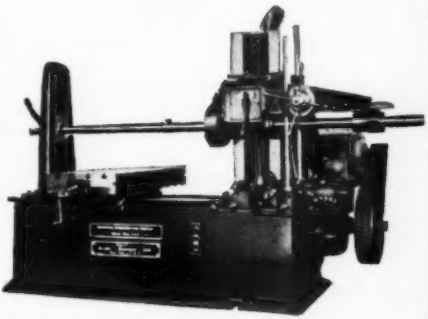
MACHINES like these were rebuilt for various arsenals of Great Britain, Canada, India, Union of South Africa as well as for leading domestic plants.



"The job of putting all available machines to work" means YOUR machines too — machines now in your shop — that are not up to the right degree of accuracy in production.

You may not want to send us a whole battery of boring mills or milling machines for instance, for rebuilding. BUT you can send one or two at a time.

Visit our plant—see the machine tools being tested under power— convince yourself that the job of rebuilding these machines is done with care and precision and with a minimum of delay.



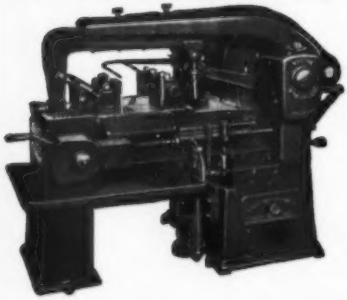
Write for prices—tell us what tools need rebuilding—give complete details.

ATLANTIC MACHINERY CORPORATION

149 BROADWAY **NEW YORK**

Tel. WOrth 2-0662 **Cable Address: Atmacor**

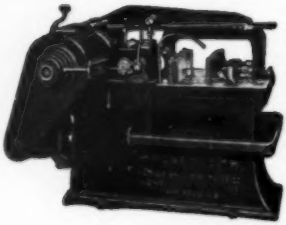
RACINE HYDRAULIC METAL CUTTING MACHINES



A complete line of power saws offering the advantages of hydraulic feed and control.

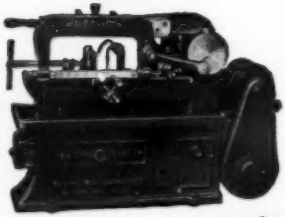
1. Single dial to control pressure and feed.
2. Single lever controls clutch and rapid traverse.
3. Freedom from adjustments. Fewest moving parts.
4. Fastest sustained production—and close accuracy day in and day out.

RACINE Heavy Duty Hydraulic Series. Fastest cutting for heavy bars, billets, die blocks. Single lever all front control. Capacities 10"x10" up to 14"x20". May be equipped with the RACINE Hydraulic Automatic Stock Feed.



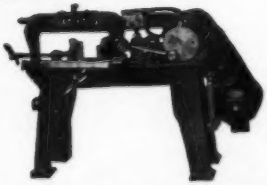
RACINE Hydraulic Oil Cut—6"x6" capacity. A fast cutting, accurate, medium duty production saw. New in principle, modern in design. May be equipped with the RACINE Hydraulic Automatic Stock Feed.

RACINE Hydraulic Utility Saw—Wet Cut—6"x6" capacity. Hydraulic feed and pressure control. A fast, accurate, moderate duty saw. The wonder saw at a remarkably low price.



A RIGHT SAW • A RIGHT PRICE

RACINE Hydraulic Utility Saw—Dry Cut—6"x6" capacity. Same as the Wet Cut in operation but lower priced. Fast and accurate. A producer for the small shop; an auxiliary in the large.



RACINE TOOL & MACHINE COMPANY
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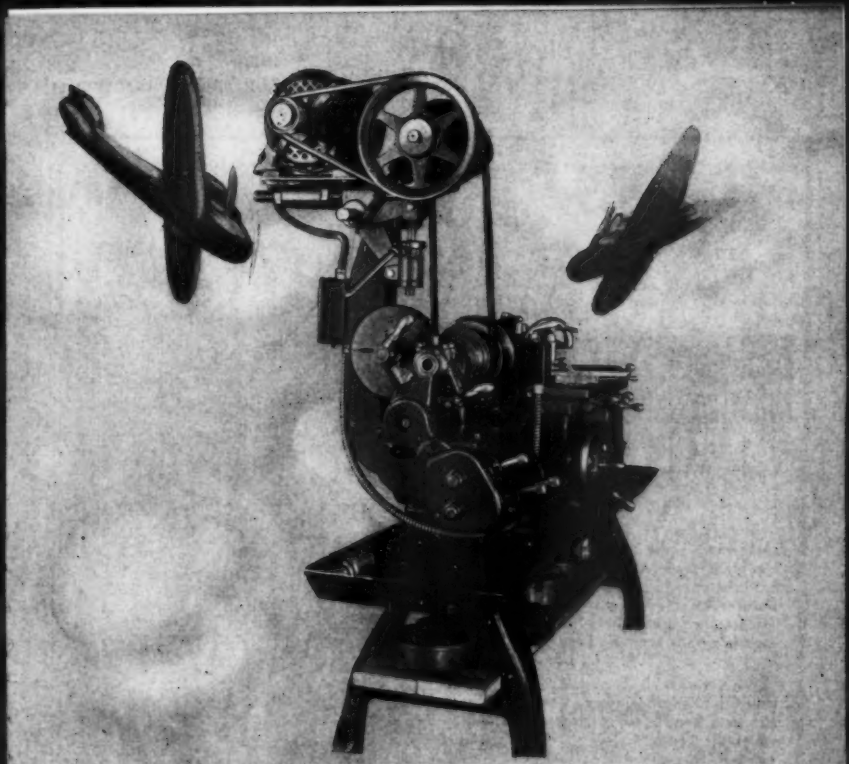

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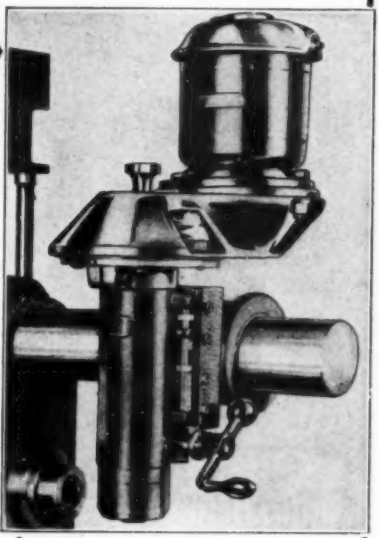

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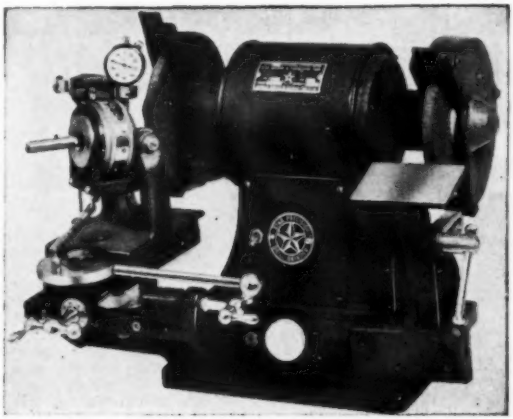

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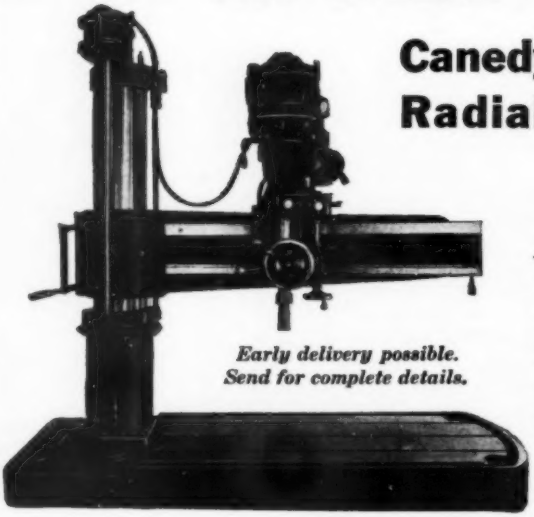

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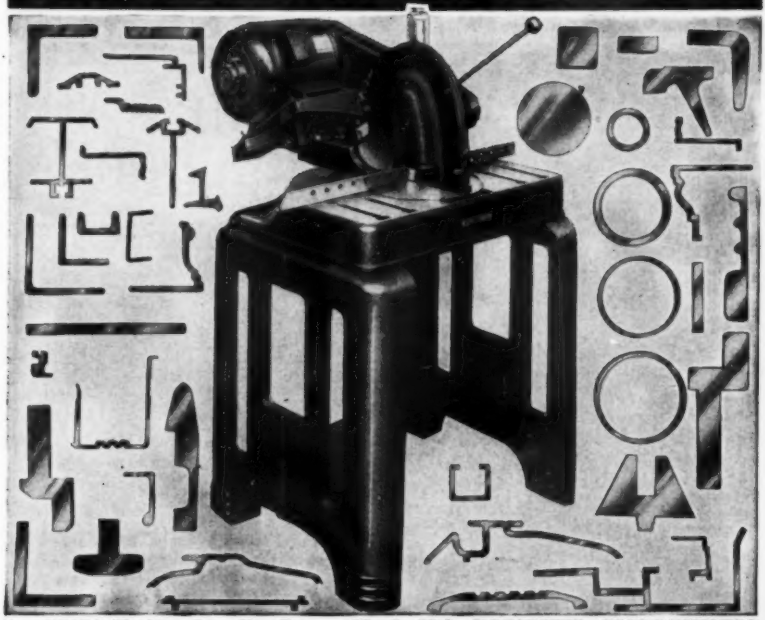
SPECIFICATIONS:

	9" Column 3' Arm	11" Column 4' Arm	11" Column 5' Arm
Drills to the center of circle on base or table	73½"	96"	120"
Length of arm	3'	4'	5'
Greatest distance from spindle to base	43½"	48"	48"
Minimum distance from spindle to base	8½"	15"	17"
Minimum distance from spindle to column	10½"	10"	10"
Traverse of spindle	9½"	9½"	9½"
Hole in spindle—Morse Taper	No. 4	No. 4	No. 4
Diameter of spindle at nose	2½"	2½"	2½"
Traverse of head on arm	25½"	36½"	48½"
Traverse of arm on column	21½"	24"	22"
Spindle speeds with 1200 RPM motor	(60, 85, 130, 180, (425, 560, 860, (1200 RPM		on all models
Spindle speeds with 1800 RPM motor	(85, 130, 180, 274, (560, 860, 1160, (1750 RPM		on all models
Feeds per revolution of spindle	(.004" .007" (.010" .020"		on all models
Bearing of arm on column	14"	16"	18"
Size of main driving motor	2 HP.	2 HP.	2 HP.
Height of drill column over gears	89"	98"	98"
Working Surface of Base	29"x45"	36"x60"	36"x88"
Net weight	4000 lbs.	6200 lbs.	7000 lbs.

CANEDY-OTTO MFG. CO.

CHICAGO HEIGHTS, ILLINOIS

New Cut-Off Machine for Non-Ferrous Metals



New DELTA Machine Cuts Non-Ferrous Metals With *POLISHED SMOOTHNESS*

The photograph above shows some of the actual shapes and sizes handled by the new Delta Cut-Off Machine. This remarkable unit is designed especially for cutting copper, brass, aluminum and other non-ferrous metals. It is equipped with a special high speed steel blade and oiling device which feeds cutting oil to the blade. It leaves the cut perfectly smooth, thus eliminating additional finishing and polishing operations. Here is a powerful, accurate machine made available at a fraction of the prices customarily charged for machines of this type.

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Solid Sections: Soft brass up to 1½" diameter; Half-Hard Brass, up to 1¼" diameter; Aluminum, up to 1¼" diameter; Aluminum Extruded Sections, up to equivalent of 2 sq. in.; Copper, up to 1¼" diameter, or equivalent of 2 sq. in.; Magnesium (Dow Metal), up to 1¼" diameter; Micarta and Similar rods, up to 1½" diameter.

Tubular Sections: Soft Brass, Hard Brass, Aluminum Copper, Dow Metal, Micarta and similar tubing, all up to 2" diameter.

Send for Special Cut-Off Machine Bulletin giving full details and prices on this Delta Cut-Off Machine and accessories.

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Featured In This Issue

"BORIZING" — Nobody knows just how long the mosquito has been practicing single point boring—with little in the way of tool trouble . Until recently though, the method was not used extensively on high production work. F. T. Ellis, Consulting Engineer for The Heald Machine Co., tells about the development and uses of "Borizing"—or the precision finishing of surfaces.

BENDING of Shapes and Bars and the distinctions between bending and forming are described by Wm. C. Tucker. Mr. Tucker is Assistant Chief Engineer, Machine Tool Division, Buffalo Forge Co., and he explains the types of equipment used and methods employed. Structural shapes, bars, flats, pipe and special shapes all receive appropriate attention.

WELDED FIXTURES is based on notes on welding practice as an adjunct to the machine shop, from an Award Study submitted to the James F. Lincoln Arc Welding Foundation. The author is Francis A. Westbrook, M. E., and he describes a number of inexpensive and quickly constructed jigs and fixtures which have helded to cut fabrication costs. The principles involved may be adapted to other shop operations.

CHANGING TOOL HOLDERS instead of changing tools is suggested by J. R. Longwell, Carboloy's Chief Engineer, as a method of stepping-up production. Mr. Longwell emphasizes the time wasted in changing tools on machines and points out that considerable time can be saved by transferring major tool adjustments to the tool room—by the simple expedient of changing holders rather than the tools themselves. Several designs of quick-interchangeable h-lders are given.

SPEED IS ESSENTIAL—J. E. Bullard explains the need of increasing production if rising costs of government are to be met without lowering living standards—and explains some of the ways in which this end may be achieved.

SELECTING PERSONNEL—In these days when skilled workers are scarce —and when some job applicants are long on salesmanship and short on performance, it is necessary to discriminate. Russell J. Waldo is experienced in hiring and gives some tips on selecting workers.

SPLINES WITHOUT BACKLASH—Describing an innovation in the machining of splines on automotive propeller shafts, permitting the large scale production of such parts without measurable backlash.

LET'S TALK SHOP—A helpful assortment of Shop hints, kinks and methods that should be interesting and useful:—An easy method of making chuck jaws; a universally adjustable eccentric chuck; a new abrasive in sheets, discs and ribbons that's applied like Scotch tape; plus some diversified welding applications.

GUARDING PRESS OPERATORS is by W. A. Vollmer, Punch Press Engineer, Employers Mutual and offers many safety suggestions for preventing press accidents.

A SERIES CIRCUIT DRIVE is by S. H. Hanville, Motor Engineer, Westinghouse Electric & Mfg. Co. In a popular manner free from technicalities Mr. Hanville tells how the series circuit simplifies adjustable speed drives, describing typical applications and advantages.

MODERN HANDLING METHODS—by George A. Fairman describes the arrangement of production lines at Heald Machine Co., and International Harvester Co. New equipment and new handling methods are included.

SOUTH BEND LATHES

REDUCE COSTS
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INCREASE ACCURACY
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PROVIDE GREATER VERSATILITY
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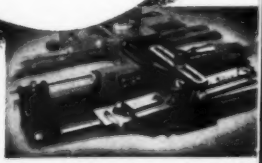
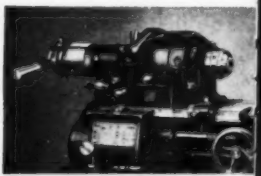
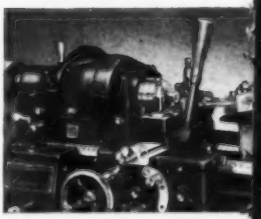
SOUTH BEND 10" SWING, 1" COLLET CAPACITY TOOL ROOM PRECISION BENCH LATHE



Turns and bores tapers up to 3½ inches per foot smoothly, easily, accurately. Telescopic feature eliminates disconnecting cross feed screw when taper attachment is in use.



For rapid production of small parts from bar stock or tubing. Stock is released and fed through collet without stopping spindle.



Permits using front and back cutting tools on lathe carriage. Has adjustable stops for regulating depth of cut for each tool. May be operated by hand lever or cross feed screw.

MODERN in design, built with extreme precision, South Bend Lathes are fast—accurate—versatile. They have the high spindle speeds and the rigidity essential for efficient machining with carbide or diamond tipped tools. They are capable of finish turning or boring with such precision that subsequent grinding, honing or lapping operations are often eliminated. And they have plenty of power and stamina for heavy roughing cuts.

Features responsible for the excellent performance of South Bend Lathes include an alloy steel spindle with hardened and superfinished bearing surfaces, one piece double wall apron with steel gears running in oil, a powerful worm drive and multiple disc friction clutch operating carriage feeds, and a direct belt drive to spindle.

South Bend Lathes are made in five sizes: 9″, 10″, 13″, 14½″ and 16″ swing, in 3′ to 12′ bed lengths, in Tool Room or Manufacturing types. Write today for a catalog.

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LATHE BUILDERS SINCE 1906

Editor's Page

FIRST the tools—and then production.

The man in the street has no conception of the task of tooling-up for defense, and is inclined to be impatient.

The fact is that Tool Builders and Tool Engineers are doing an excellent job. Once the tools are set-up and production lines organized, defense equipment will come through in the characteristic American way.

The illustration shows President Edward G. Budd of the Budd Wheel Co., presenting the millionth Budd shell case to Major General C. M. Wesson, Chief of Ordnance, 15 months after starting defense operations. The second million will be delivered in just 60 days.

Wesley G. Paulson

FOR almost a century — through wars, panics, depressions and other crises, Industry has come to Ryerson for steel. Today, stocks at the 10 Ryerson plants—America's great Reservoir of Steel — are quite complete, and service in general is prompt. In times like these, however, some sizes of certain products are low, a few are out. But for the most part, you can depend on Ryerson for good service on reasonable quantities of over 10,000 different kinds, shapes and sizes of steel and allied products.

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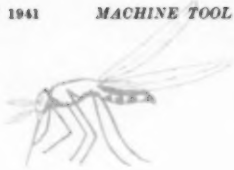
Joseph T. Ryerson & Son, Inc. Steel-Service Plants at: Chicago, Milwaukee, St. Louis, Cincinnati, Detroit, Cleveland, Buffalo, Boston, Philadelphia, Jersey City.



"BORIZING"

By F. T. ELLIS

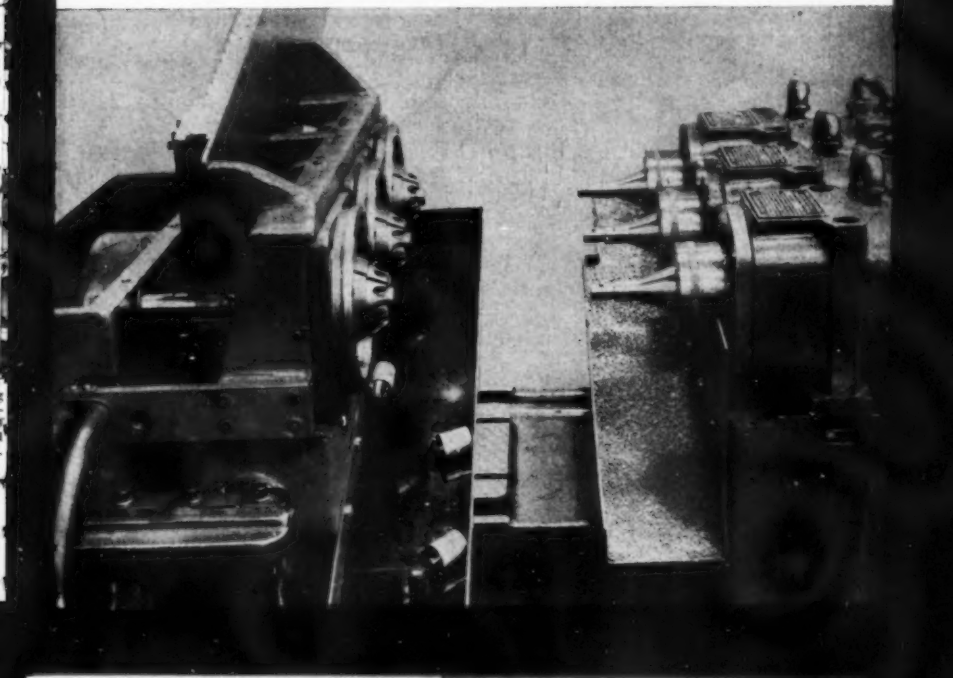
WHY do we call it "Borizing"? Well—we had to have a name for it and as the "Greeks hadn't any," we had to coin one for ourselves.

The process as applied to high production methods is really rather new and covers the single point precision finishing of surfaces, embracing boring, turning, facing, grooving, forming and even milling.

Most experienced mechanics are familiar with single point boring as applied to tool room work on jigs, etc., and as performed on milling machines, and jig boring machines. In fact, boring with a single point is probably one of the old mechanical processes of which we have record, as beads with bored holes and the stone tools resembling arrow heads which were used for producing these holes, have been found among the oldest relics of mankind.

It is suggested that even before man existed, the mosquito practiced single point boring—as he still does—with apparently little in the way of tool trouble.

The single point method has never, until recently, been used to any appreciable extent on modern high pro-



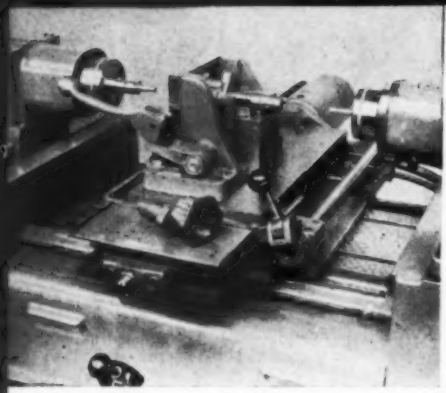


Fig. 2 — Finish boring and facing pump bodies.

ductive work, largely because of lack of proper equipment to make it desirable and profitable; and until very recently, the accepted method of producing accurate and smooth holes in soft materials was to use a multiple fluted reamer. There always were certain objections to the reaming operation because it requires the services of an expert tool maker to sharpen the reamer properly so it will cut to size and cut smoothly. Furthermore, the reamer had to be guided through a bushing which was subject to wear, and as a consequence, it has not been easy to machine the bored hole exactly where we would like to have it, nor to hold it to size nor to have it as smooth as was many times required.

Insofar as turning grooving and facing operations are concerned, it was never considered practical to try to finish them on a lathe or a turret machine, and many times, soft parts were subjected to a grinding operation in order to obtain the necessary accuracy and smoothness.

The Borizing equipment has changed all this, and many of the more progressive concerns are finding that they can finish their parts to limits of accuracy which were before unobtainable, and with smoothness which is equivalent to that produced by a grinding wheel, and in some cases even better.

Possibly the development of this equipment has been due, more than any one thing, to the introduction of cemented carbides such as tungsten, tantalum, titanium, etc. This material is tremendously resistant to abrasion and heat, and permits cutting speeds far in excess of anything that was obtainable with steel tools. There are a great many different grades of this material and much is being learned every day about the adaptability of these various carbide mixtures to such classes of work.

The first machines, which were largely experimental, were built for finish boring of non-ferrous materials only, and were equipped with diamond pointed tools. Diamond tools are still used and give excellent results, particularly on bronze and babbitt, but their success depends on having exactly the right kind of a diamond. The diamonds seem to vary a great deal and to be

Fig. 3—Facing clutch surface on flywheels.

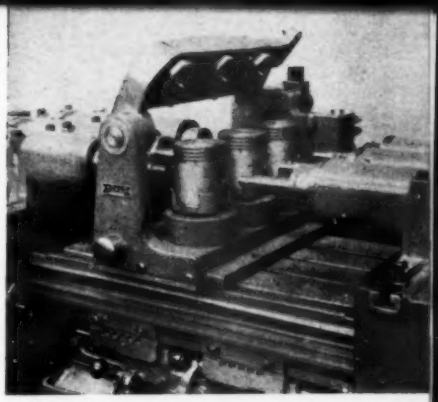


Fig. 4 — Boring wrist pin holes in pistons.

rather unreliable in structure. On this account, uniform results cannot be guaranteed; whereas carbide tools, if made of the same material, and to the same shape, can be depended upon for uniform results. It would seem, with the further development of cemented carbides, that the diamond may be used less and less in the future for this particular work.

While the advent of diamond and cemented carbide tools was very important in introducing the borizing equipment, these advances alone were not important enough to cause much excitement among the process engineers in the modern productive plant. They still needed different machine equipment to handle these new tools. Machines with screw feed, gear drives, and vibrating sections would not produce satisfactory results with any sort of tool, so it was necessary to develop new equipment, employing belt drives to the spindle and with superfine ball bearings to support the spindle, and to enable it to take high speeds and heavy loads without deflection, being so designed as to remain rigid and true over years of service.

Hydraulic feeds and controls for the tables, cross-slides, and other mechanisms gave a flexibility of control and a smoothness of motion so necessary to fine finishes, which incidentally permitted the handling of several jobs that at least, would have been extremely difficult on the old equipment. Along with this smoothness and flexibility of operation has come a freedom from complicated mechanisms, and as a consequence, an experienced or skilled operator is not necessary to handle these extremely simple machines.

As the development of this process of single tool finishing has progressed, users have learned that many parts can be bored, turned, etc., which formerly were considered only for grinding, and ideas of tolerances have been so radically changed now that it is found possible to bore and turn and face to "tenths" with a "tool." Engineering design is now modified to suit "borizing" operations and tolerances specified which were formerly thought impossible, or at least impractical.

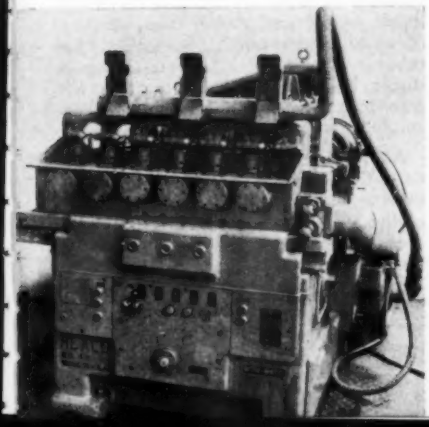


Fig. 5—Finish boring of connecting rods.

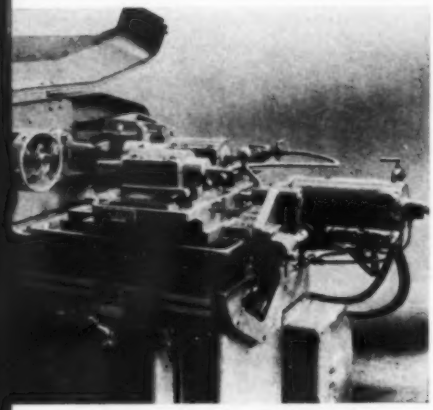


Fig. 6—Boring valve bodies and turning plugs simultaneously.

Now that "super finish" has come into the limelight, it is probably safe to say that the trade is fast becoming "surface conscious," and the profilometer check now tells us how good the surface is. It is no longer a matter of argument or opinion.

To those familiar with the micro-inch specifications, we can say that it is now possible to bore holes in non-ferrous materials to approximately one micro-inch. That is **smooth.**

Furthermore, the type of surface from the cut, being very like a fine thread, is ideal for various types of honing or super-finishing operations. This surface makes a fine seal for taper valve seats, carburetor needles, and similar applications.

Almost all the large manufacturers of valves use borizing equipment for their plugs and bodies, the machines being so arranged as to bore the body and turn the plug on adjacent spindles simultaneously, using the same slide for the taper, so that both have the same amount and the two fit together without any lapping whatsoever, and, of course, the parts are interchangeable. In regular daily practice these are machined without difficulty to hold a 75 lb., per square inch air test without any lapping or fitting together at all

In turning and boring these parts, it is of course necessary for the tool to skip across the port openings which ordinarily would be expected to affect the finish.

A short time ago, it was the general opinion that steel parts could not be successfully finished on this equipment, but today all kinds of steel is being finished to fine limits on borizing equipment and in many cases, these machines are replacing grinders for this work.

It has been found possible to machine nickel steel parts as hard as 52 Rockwell C hardness without any particular difficulty, with a surprisingly smooth finish and very reasonable tool life. Some steel parts are run as high as 1,000 f.p.m. cutting speed across holes and interruptions; while on some grades of C.I., cutting speeds as high as 1,200 f.p.m. are obtainable.

Aluminum can ordinarily be run up to 3,000 or 4,000 f.p.m.; and on facing operations, even much higher speeds are used where a single point cutter, rotating at high speeds, gives a finish much better and flatter than can be obtained by any lapping operation. This process is used on such parts as valves under high pressure, where it is not safe to use a gasket and where absolutely flat surfaces must be machined.

As was mentioned earlier in this article, the process is relatively new, and even though thousands of various types of these machines are in use, they still are being developed and improved. Much remains to be done, but right now, they are unquestionably among the most versatile of all the standard types of machine tools and more different kinds of productive jobs can be done

See Those Chips!

SHEAR TOOTH FILE

for rapid soft-metal removal PLUS smooth finishing

"GET IT GOING and get it done!" is the order of the day along the production lines of thousands of foundries and machine-shops sweeping ahead with the nation's defense activities. Here's a file that can "step along" under that sort of command . . . the special-purpose Nicholson or Black Diamond Shear Tooth!

See the chips fly as this deep-biting file roughs down a casting of aluminum, copper or brass! Then, under lighter pressure, see how this same file can work the part down to a smooth finish!

The Shear Tooth is one of an array of special-purpose files made by the world's largest file manufacturer to provide industry with *The right file for the job.* Let your mill-supply house look after your requirements. *Free Technical Bulletin.*

NICHOLSON FILE CO., Providence, R. I., U. S. A.

(Also Canadian Plant, Port Hope, Ont.)

The combination of the coarse single cut and long angle helps the Shear Tooth to clear itself of chips—minimizes clogging. Coarseness provides fast cutting; long angle gives shearing or shaving cut, leaving smooth finish. Note contrast with Mill Bastard below.

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Fig. 7—Heavy duty boring-turning-facing of pump bodies.

on them than on any of the conventional types of equipment. Tolerances can be maintained to exceedingly close limits, and it seems safe to say that no equipment employing cutting tools can approach the smooth surface finish produced by these machines.

The leading manufacturers of precision parts, including all aircraft engine builders, are learning to appreciate this borizing equipment and are specifying it more and more for various manufacturing processes.

With the new developments planned in the near future, it looks as if this borizing equipment would have a very prominent place in future production lines. Round parts need to be machined rounder than we machined them before. Holes should be more accurate in size, parallelism, and position, as well as with smoother finish. It is our job to produce flat surfaces, flatter than they have been produced before, and to do all this more economically is also our task.

This is all in the way of progress, and borizing equipment certainly fits this picture.

Think it over!

EXPLANATION OF JOBS ILLUSTRATED

Fig. 1 (on title page) shows rear view of a No. 49 S. E. Automatic High Production Boring Machine with magazine loading. It is shown boring King Pin Bushings three at a time. Machine is arranged for continuous operation with loading by chutes. There are three stations, three boring heads on left hand bridge—three station fixture on table and three station loading bracket attached to right end of machine in place of bridge.

Fixture has three diaphragm chucks operated by oil pressure through cams and three loading chutes.

At beginning of cycle, table is at left end and work has dropped down into "V" blocks in line with chucks at each station. Operator starts machine to right and cam on loading bracket operates hydraulic cylinder which opens diaphragm chucks and three projecting loading plugs on loading bracket position three bushings within the chucks. At end of traverse to right, cam controlled cylinder closes diaphragms, clamping work on outside diameter. Table then reverses automatically to left at rapid traverse with heads meanwhile rotating, and at end of traverse, table reverses automatically to right, slows down to boring speed and bores three bushings without drag lines.

At end of cut, table is accelerated to rapid traverse to right end of machine, finished bushings meanwhile are ejected and new pieces loaded. The cycle proceeds continuously in this manner, the operator only having to keep loading chutes full.

Special arrangements are provided on machine to restrict expansion of base, bridge and heads to maintain concentricity within .001" T.I.R. These provisions include water cooled heads; bridge made of Invar metal; outside tank for hydraulic oil with motor and pump; louvres in guard in end of machine and cooling fan; asbestos packing around table hydraulic cylinder and separate pump to return lubricating oil to outside tank.

Fig. 2—A No. 49 D. E. machine which is shown finish boring and facing gear pockets and shaft holes in automotive oil pump bodies. Hydraulic cross slide is utilized to index part from one gear pocket to the other.

Fig. 3—shows front view of a No. 41 facing clutch surface on automotive flywheel assemblies.

Fig. 4—shows a 46-A machine semi-finish and finish-boring wrist pin holes in automotive pistons. Fixture is open, ready for removal of pistons that have been bored. Three pistons are bored simultaneously, be-

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ALTER EGO: Yes, but, most of all, the *demonstrator* was good. How about the *conditions* of the show?

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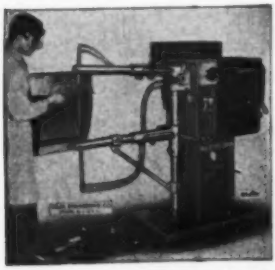

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ing located from the beveled edges inside skirts. The wrist pin bosses are located by spring-floating "V" blocks, center hole in dome and from top of dome. Fixture is operated hydraulically.

Fig. 5—No. 42 high production machine for finish boring both holes in automotive connecting rods. Note the chip removal ducts. Three rods are loaded while three are being bored. Crank holes are bored to 2.2200"—2.2195". Pin holes are bored to .7503"—.7506". Six spindle boring head unit on rear slide. There are two tools per quill. Spindles for pin holes carry retraction units which provide tool adjustment from the front by wrench. Rods are held in six station fixture on front table. Table indexes hydraulically for boring alternate rods. Rods are located from centers of both ends, clamped hydraulically and automatically against three pads on crankhole face. Bronze chips are removed separately by exhaust manifolds.

Fig. 6—Boring valve bodies and turning plugs simultaneously with a No. 47-A machine with hydraulic facing slide. Front station: bore valve cocks. Rotating fixture. Locate valve cocks by hand plug. Clamp by two pull-back fingers. Rear station: turn valve plugs. Locate on centers. Adjustable tailstocks. Tools mounted on angular hydraulic cross slide. Special hydraulic facing attachment is provided for facing shoulder on stainless steel valve plug discs.

Fig. 7—Angle view of No. 42 machine boring pump bodies, held in rotating fixtures. Three jaw chuck in first station at left. Three finger fixtures in other two stations, all air-operated. Tool blocks are carried by subbase attached on table. Entire tool block assembly is removable as a unit. Pump bodies are finished progressively, from left to right, producing one complete pump body in third station every cycle. Operations including boring, plunge facing, generated facing, turning, grooving and counterboring are all performed automatically in same cycle.

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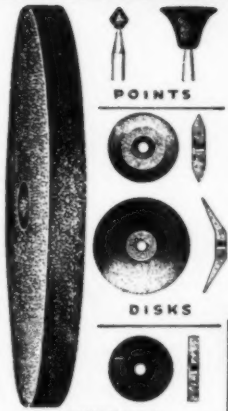

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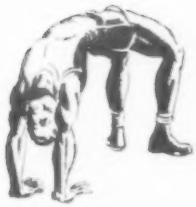

BENDING

By WM. C. TUCKER

THE purpose of this article is to treat in a simple way the subject of bending rolled metal shapes on power driven bending rolls. It is important that a distinction should be made between bending and forming. These are two entirely different types of metal working, although closely related and performed on machines employing similar principles. We shall confine ourselves in this discussion to bending of metal in one plane only, that is, to produce circles, arcs and spirals.

It may be stated that the process of bending is a simple one, and perhaps because of its simple nature, many common facts are frequently overlooked when it is desired to bend some particular shape or section. Bending rolls also are machines simple in principle. However, a strict observance of the underlying principles of bending and bending rolls is very necessary for successful bending performance. Primarily, all bending of uniform sections is based on the beam bending formula, assuming that the neutral axis is in the center of the section and that the metal above this axis is subject to compression while the metal below the axis is stretched, or in tension. This supposes that the bending force is being applied from

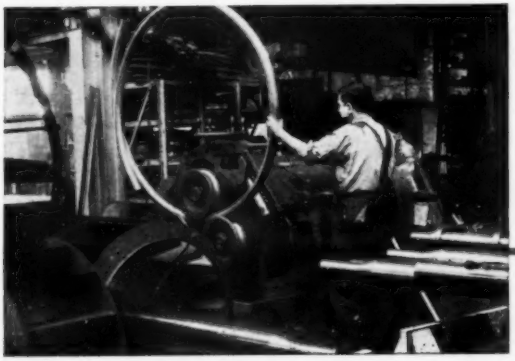

Fig. 1—Vertical type pyramid roll, bending pipe. Used for making heavy pipe coils, also for bending aircraft engine mounts.

Fig. 2—Horizontal type pyramid roll for bending heavy work of large radii such as bending angles for tanks.

above in a downward direction, with an equivalent total of reactions from below. When the section to be bent is not uniform or symmetrical, then the neutral axis moves either up or down, in the direction of the heavier part of the section.

With this basic consideration in mind, it is possible to analyze any section to gain an idea of what will occur when that particular section is subjected to bending stresses that exceed the elastic limit of the material. It is to be recognized, of course, that the resulting conditions will vary in accordance with the direction in which the section is to be bent. The portion of the section that is stretched during bending naturally becomes elongated and, of course, becomes thinner in proportion to the amount of elongation. This action also, always tends to reduce the height of the section. On the other hand, the portion of the section that is subjected to the compressive stresses of the bending operation increases in width since it is being shortened and the metal must go somewhere.

It can be seen from this, that when a section is stressed beyond its elastic limit, a certain degree of plasticity occurs within the metal, at the point of greatest stress and the result is a modification of the shape of the section. This must always be kept in mind when designing a metal part formed from a bent section, as the changes in shape after bending may affect the fit of this part with other parts. Compensations in design must be made to accommodate this condition.

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It should be plain now that bending machines, especially the rolls themselves, must have suitable features incorporated in their design that will take care of the changes in the shape and size of bent sections. More will be said about this later in this article, after we have discussed the general principles of a bending roll. Structural shapes, bars, flats, pipe and special shapes will each get a little attention.

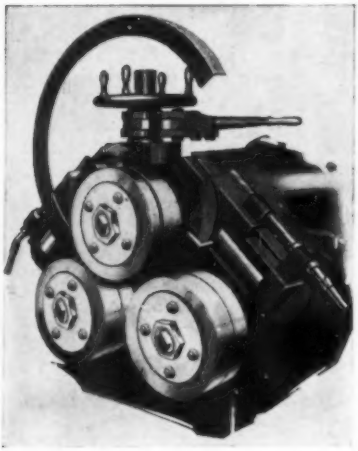

Fig. 3 — Bending angles on vertical type pyramid roll with "leg-in" attachment.

There are fundamentally, two types of bending rolls—the pyramid type and the pinch type. In the pyramid type, three rolls are employed—two lower rolls of like diameter placed on fixed centers of the same elevation and the third or upper roll placed above and between the lower rolls. The position of the upper roll is variably adjusted in vertical relation to the lower rolls. All three rolls are driven. The work rests across the two lower rolls and mid-way between the two points of support, it is depressed by the upper roll. The position of the upper roll, or rather the amount of deflection its position produces in the work, determines the curvature of the finished piece. In the pyramid type of machine, the upper roll is never set close enough to the lower rolls actually to "pinch" the work. In other words, the space between the body of either lower roll, and the body of the upper roll is always more than the height or thickness of the work. In the pinch type of roll, as the name indicates, the work is firmly gripped between the stationary and the adjustable rolls, both rolls, of course, being driven. In this type of machine, either three or more rolls are used. The pinch rolls, or main rolls, are two in number — one upper and one lower. These two rolls are usually arranged, one directly above the other, and either one may be the adjustable one. The adjustment is of the screw-down type, to produce any degree of pressure or pinch on the work, as may be desired. On either or both sides of the pinch rolls are located the adjustable rolls that produce the deflection in the work, by virtue of their position in relation to the opening between the pinch rolls. These side rolls are usually arranged to move within the adjustment guides at an angle of 45° or 60° inclination toward the vertical center line of the pinch rolls.

This then describes briefly, the distinguishing features of the pyramid and pinch type machines. Both types of rolls, however, are equipped similarly with guide rolls, shoes, and other attachments whose purpose is to insure trueness and squareness of the finished product. The quality of the bent product depends largely on the efficiency and proper design of these guiding and finishing attachments. Equally important, are the type, design and material of the rolls proper. This can be brought

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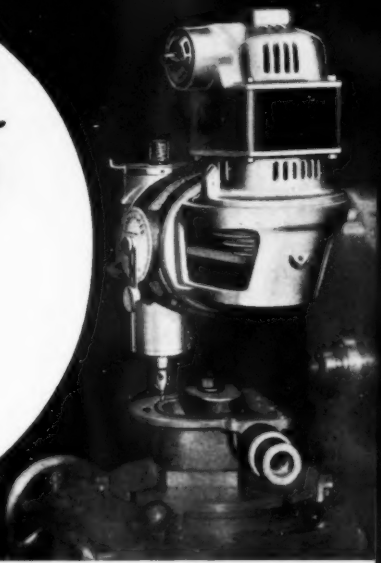

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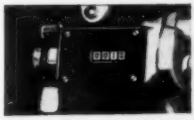

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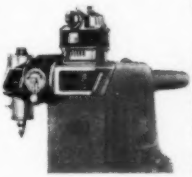

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out more clearly as we discuss the bending of specific sections.

Rings bent on a roll, however efficient, will require machining for accurate work under 1/8" on the diameter. There is also a certain amount of "spring-back" in the material due to its elasticity. Allowances must be made for these conditions and, therefore, the rings should be rolled slightly undersize. A minimum of 1/8" must be allowed on the radius for machining when a machine finished ring is desired.,

The pyramid type of roll is used in both the vertical and horizontal designs. The horizontal machine lends itself better for the bending of heavy work in large radii and diameters. On this type of roll, the work is bent in a horizontal plane, making it more convenient to support the large work on stands and tables or rollers, rather than to produce it on the vertical type machine which would necessitate the use of an over-head crane to support the work in mid-air. This, of course, would be inconvenient and difficult, inasmuch as the work would move constantly as it progressed through the rolls and would be subject to twisting strains. The horizontal type roll, therefore, finds its best application in tank shops, heavy structural and bridge plants as well as shipyards.

The vertical type machine is used on all general purpose bending and its applications are far too numerous to list here. More and more uses are being found for these machines, as it is discovered that the production of many curved and bent parts can be increased by rolling, while the cost is proportionally decreased.

When it is desired to bend channels or I-beams the "hard way," it should be remembered that these are sections that have been designed specifically to resist bending. Therefore, one should not expect to bend them. The vertical thin web of the beam has a tendency to collapse unless fully supported from both sides at the point of bending. This is not possible beyond certain modest limits. Bending of these same sections side-way, or on the flanges is a relatively easy matter, and presents no special difficulty.

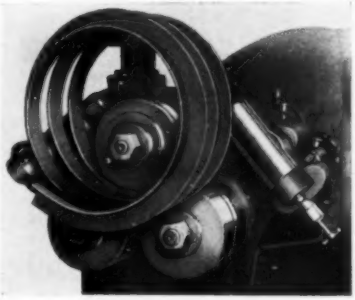
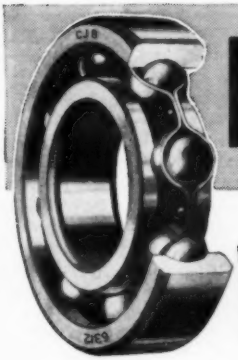


Fig. 4 — Bending angles leg-out in spiral form.

All the following discussion is concerned with is the bending in a vertical plane on vertical type rolls. Angles must be bent on rolls having slots for the vertical leg of the angle. These slots must vary as the size of the angle varies, therefore, the rolls must have a suitable method of adjustment. When bending angles "leg-out," the slots in the two lower rolls are set to receive the vertical leg of the angle. The slot in the upper roll is closed. It is important that the edge of the slot, rolling along the fillet of the slot, be rounded to a radius not less than that of the angle fillet; whereas, the opposite side of the slot, at the heel of the angle, should be square to lend as much backing-up area as possible to the heel. It must be expected that the vertical leg will become slightly shortened due to the circumferential stretching of the metal.

When angles are to be bent "leg-in," the slot in the upper roll is opened,



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and the slots in the two lower rolls are closed. The same attention must be given concerning the rounded and square edges of the slot, to correspond with the fillet and the heel of the angle. Bending angles "leg-in" is ordinarily a much more difficult process than "leg-out" bending, from the standpoint of results. There is a considerable tendency for the angle to twist as it emerges from between the rolls. It also gets out of square, reducing to less than the 90° angle between the two legs. Compensation for both these conditions can be made by the use of certain patented attachments featured by a leading bending roll manufacturer.

The "closing-in" condition mentioned, is the result of the distortion stresses occasioned by the stretching of the metal in the horizontal leg of the angle. It exists in all sizes of angles, in varying degrees of intensity, and should therefore serve to illustrate the importance of a proper roll selection that provides for all these conditions.

It is well to remember, however, that all rolled structural sections are not perfectly square, true or sized when received from the mills. There are mill tolerances covering these conditions which must be recognized; not interpreted as poor bending roll performance. A bending roll cannot correct inaccuracies which originated at the mill. Angles and zees, for instance, may come from the mill with the depth of the section $\frac{1}{8}$" over or $\frac{1}{16}$" under. The length of the angle legs may also vary from $\frac{1}{8}$" over, to $\frac{1}{16}$" under. The angle legs may be out of square as much as 1-$\frac{1}{2}$° per inch of leg length, either over or under. The gage and weight may also vary as much as 2-$\frac{1}{2}$% over or under. Similar tolerances in varying degrees also apply to other sections.

When angles are light and the radii short, spacer rings should be used to support the inner or vertical leg. These spacer rings are equal in thickness to the thickness of the angle being rolled. The diameter of these rings is such that

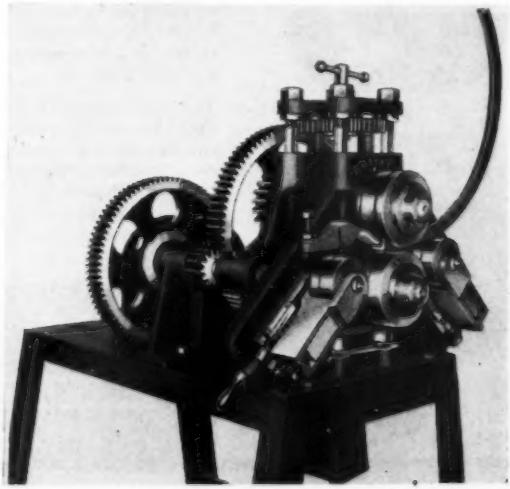

Fig. 5 — Pinch type roll bending angle with "leg-in" attachment.

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the toe of the angle leg within the slot bears on the O.D. of the spacer ring.

Angles, as well as other shapes or bars, when started through the rolls will have a short straight portion at either end of the finished piece. The length of these straight ends is, roughly, equivalent to one-half the distance between the centers of the two lower rolls. Material must be cut to lengths to include an extra amount for these straights. After the material has been run through the rolls until the ends meet, these straight ends may be cut off and the work then placed into these rolls, closing up with subsequent rolling to form a fully round circle. A crimping press may be employed to pre-form these ends on material cut to exact lengths, thus preventing the waste of cut off ends. Another method of saving on material, providing it is not too heavy in cross-section, is to spiral it from long lengths right to the required ring diameter. After the spiral is completed, the rings are cut apart with a saw. The only waste is the two short ends for the entire piece of straight material from which have come the multiple rings.

Other sections besides angles may be rolled in spirals, such as flats, rounds, squares and pipe.

Spirals or coils are rolled merely by springing the lead end of the first circle, either by hand or by means of a diverting roller. As the machine continues to bend the stock from a long length, the material will move out from the front of the rolls in a series of spiralled circles. When rolling flats on edge, especially to the smaller diameters, the outside of the ring is stretching as already explained. Therefore it becomes thinner. The inside edge, due to the compressive stress, is upsetting and getting thicker. These changes take place symmetrically and, therefore, it is important that the roll slots have

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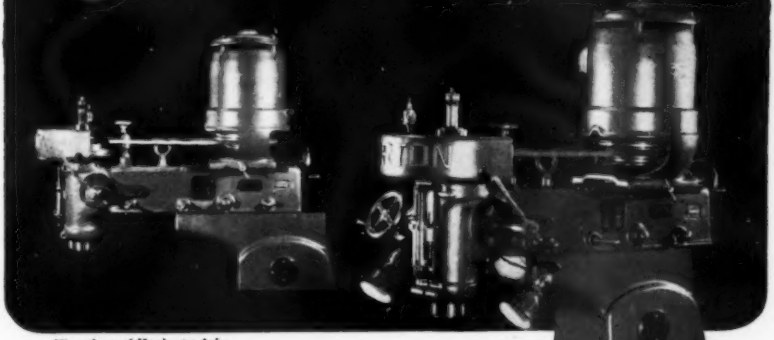

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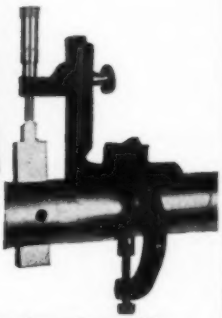

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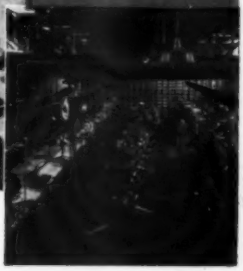

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Formed sections that are hard to bend, due to the difficulty of fully supporting the section within the rolls and the resulting distortion, may be built up. This is done by bending component parts of the section made up of simple angles, flats, squares or rounds and then welding these parts together to produce the required form in its bent shape.

In conclusion, it may be assumed that any deformation of a section resulting from bending it into an arc, circle or spiral is due to the induced bending stresses and not to any fallacy of roll design. However, proper roll design and rolling practice can correct and modify most of such deformation but not, in all cases, all of it. Roll bending, like any other metal working process, has its limits of possibility, but in general it may be stated that its field and successful performance have increased greatly during the last decade.

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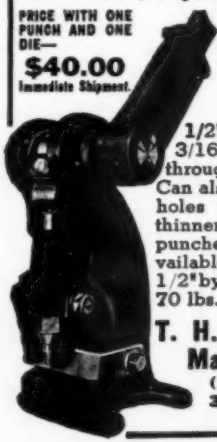

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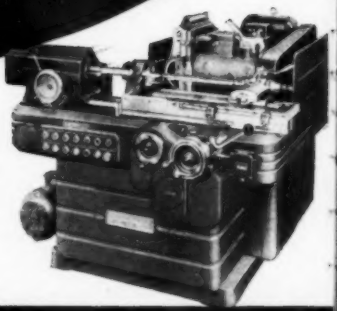

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EX-CELL-O (XLO) *Precision* **MACHINES AND TOOLS**

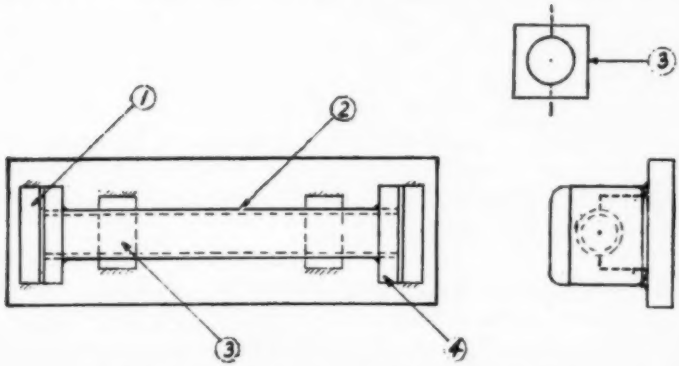
Welded Fixtures

By FRANCIS A. WESTBROOK, M. E.

INEXPENSIVE and quickly constructed jigs and fixtures have a most important bearing on the great amount of new tooling involved in the defense program; and the part which arc welding is now playing as a means of fabricating them is one which cannot be over-emphasized where the constant call for speed and more speed is now the rule. The question of new dies, jigs and fixtures arises the moment a change of design or improvement is contemplated. Where the product itself consists of several sub-assemblies, it is indeed a question deserving careful consideration. The cost and speed of short-production runs are naturally greatly affected if jigs and fixtures can be made quickly and economically, as by arc welding, so that in progressive shops today, welding has become as indispensable as drill presses.

Complete departments are being set up composed of all-welded machinery and equipment, designed and built right in the shop at great savings in time and money, made possible by the use of arc welding and the cutting torch. Along with them a place has been found for much scrap material, which is now also of great importance with the prospective shortage of raw materials.

The essential characteristics of arc welded jigs and fixtures as compared to other methods of construction may



Sketch 1—Showing details of welded flange assembly fixture.

TABLE I—FLANGE ASSEMBLY JIG

Part No.	Part	Material	No. required
(1)	angle	1½x¼x3"x4" long	2
(2)	tube	2½"o.d.x14½	1
(3)	pad	1"x3"x3" (makes 2)	1
(4)	flange	to suit	2
(5)	base	¾x6x17½ OHS	1

TABLE II—COMPARATIVE COSTS AND WEIGHTS

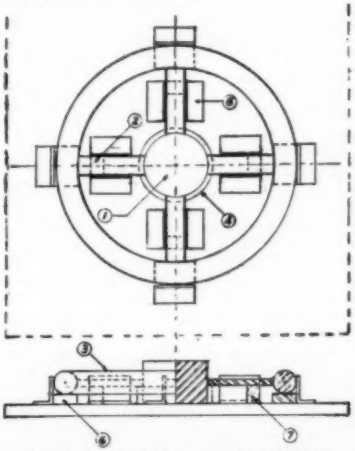
Welded		Casting	
Weight	23 lbs.		28 lbs.
Cost of steel	.92	Pattern	6.00
Burning	.90	Casting	1.96
Drilling	.55	Machining	5.25
Assembly	.90		
Welding	1.35		
Grinding	.40		
Total Cost	$5.02		$13.21

be classified briefly as:—lower cost, reduction in weight, greater strength, speed of construction, simplified design and minimum machining. Showing how these advantages work out in practice, a few examples of what has actually been done in a certain shop are given in some detail. The burning costs in the estimates are considered the same, whether the shapes are cut with the shop equipment or are ordered in the required sizes and shapes from the mill, there being practically no difference. However, it is worth bearing in mind that having the burning equipment on hand in the shop may be a great convenience and time saver over ordering, especially where scrap can be used.

The first example selected is a flange assembly jig, used for applying the flanges on the tube for an engine water connection, as shown in Sketch 1. The angles (1) are tack welded across the ends, as are the pads. The pads (3) are burned out square, then drilled through the center and sawed in half. In assembly, the flanges are clamped to the angles, tacked in several places and set aside for complete welding. The material needed is shown in Table I.

The comparative costs and weights of welded construction and castings are given in Table II.

A wheel assembly jig is shown in Sketch 2 and provides an example of a tool for small scale production. At the time this was made, 10 hand wheels were needed for a machine. Considerable time would be required for a pattern and the price for casting such a small order would run high. The answer was a welded wheel and a welded jig to make it. Another point was that this particular jig could be converted to other products such as pulleys, gear blanks, etc.



Sketch 2—Details of wheel assembly jig.

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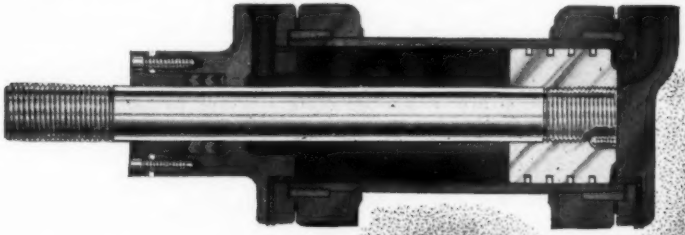

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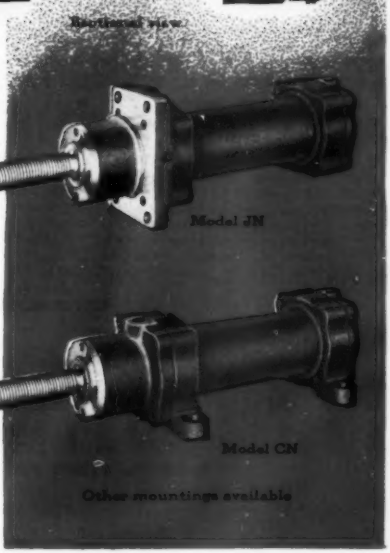

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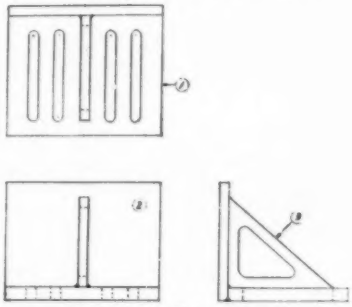
In operation, the hub (1) is placed into the collar (4) and the rim is placed in between the angles (5). The spokes are then set between the other angles and tacked to the hub and rim. After all tacking is complete, welding proceeds on the under side. Details are given in Table III.

Sketch 3 shows a drill jig. In setting up this jig for welding, precautions must be taken to prevent warping. The face plate (2) is first squared up to the base and tack welded, top and bottom. The rib (3) is then put in position and tacked.

Before welding, a piece of bar stock or heavy angle should be clamped across the bottom of the base and another across the face plate. The continuous weld at the joint of the base and upright should be made first. Then the rib should be welded. The weld across bottom of base should be the last operation, after which the jig should be allowed to cool in the clamps.



Sketch 3—Drill jig design.

In the welding operation, a penetrating bead should be run first, after the tack welds have all been made, and then finish wire should be used to make a smooth job. Details are given in Table IV.

TABLE III—WEIGHT AND COST COMPARISON

Welded Construction		Casting	
Weight	30 lbs.		40 lbs.
Cost of steel	1.20	Pattern	12.00
Sawing	.70	Casting	2.60
Assembly	.90	Machining	10.50
Welding	1.35		
Grinding	.40		
Total cost	$4.55		$25.10

MATERIAL NEEDED

Part No.	Part	Material	No. Required
(1)	Hub	2½"x4"	1
(2)	Spoke	¼"x¾"x2½"	1
(3)	Rim	1"x30"	1
(4)	Collar	2½"I.D.x¾" pipe	1
(5)	Angle	1"x⅛"x1½"x2½"	12
(6)	Pad	½"x1"x1½"	4
(7)	Pad	½"x¾"x¾"	4
(8)	Base	½"x14"x14"	1

TABLE IV—WEIGHT AND COST COMPARISON

Welded Construction		Casting	
Weight	238 lbs.		260 lbs.
Cost of steel	9.52	Pattern	24.00
Burning	1.35	Casting	18.50
Drilling	.50	Machining	10.50
Assembling	.45		
Welding	2.70		
Grinding	.40		
Machining	5.25		
Total cost	$20.17		$53.00

MATERIALS NEEDED

Part No.	Part	Material	No. Required
(1)	Base plate	1"x18"x24" OHS	1
(2)	Upright	¾"x18"x24" OHS	1
(3)	Gusset	¾"x14"x16" OHS	1

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A welded motor test stand is shown in Sketch 4, which represents a worthwhile saving in cost and weight. This stand presents a number of difficulties which must be understood and met in order to do the job in a minimum of time and cost. The material is 1½" thick throughout, and as practically 50 feet of welding is required, involving seven separate pieces, exceptional care is necessary for good fusion. Here is the procedure which has been found to give good practical results:

First, the uprights (3) and center stiffeners (4) should be chamfered ⅜" at 45° at the joints to insure proper penetration on the first pass.

Second, the set-up must be watched to prevent cracked welds.

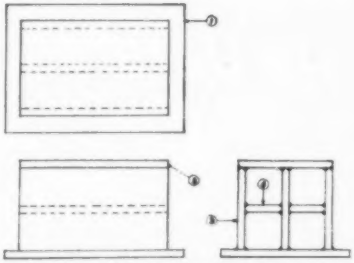
Third, after the complete assembly has been tacked, passes are run with a small rod at the center of the cross, looking at the end view.

Fourth, the other welds on the inside of the box are made, working from one side to the other, distributing the heat evenly over all surfaces.

Fifth, all slag should be cleaned out after each rod, and after the inside has been completed, an inspection should be made for cracks.

Sixth, the outside passes are then made, diagonally from corner to corner.

Seventh, after the first pass has been completed for the whole job, the finish weld should be carried out in the same manner, working from the center outward.



Sketch 4—Construction of motor test stand.

Arrangements must be made to complete the welding of this job without interruption, to avoid chilling which might crack the incompleted welds. If a crack should occur, it should be chipped or burned to a reasonable depth and re-welded. It is not sufficient merely to weld over a crack.

Fixtures or stands of this character, fabricated of comparatively heavy stock involving a large amount of welding, which are subjected to sudden loads or constant vibration, should be normalized to relieve stresses set up by the welding process. This treatment will eliminate chance of breakage if the proper welding procedure has been followed. Specifications are given in Table V.

The press shown in Sketch 5 is an example of what shielded arc welding

TABLE V—WEIGHT AND COST COMPARISON

Welded Construction		Casting	
Weight	1386 lbs.		1824 lbs.
Cost of steel	54.72	Pattern	45.00
Burning	7.20	Casting	127.68
Assembling	5.40	Machining	7.00
Welding	32.40		
Grinding	.75		
Machining	7.00		
Total cost	$107.47		$179.68

MATERIALS NEEDED

Part No.	Part	Material		No. required
(1)	Base plate	1½"x25"x35"	OHS	1
(2)	Top plate	1½"x19"x29"	OHS	1
(3)	Uprights	1½"x16"x29"	OHS	3
(4)	Stiffeners	1½"x7"x29"	OHS	2

JACOBS CHUCK: 0 to ½" capacity or No. 1 Morse Taper.

SPINDLE SPEEDS: four — from 600 to 5000 r.p.m. with 1740 r.p.m., ½ h.p. single phase motor. Eight speeds — from 600 to 10,000 r.p.m. with two-speed 1740-3500 r.p.m. three phase motor with push-button control.

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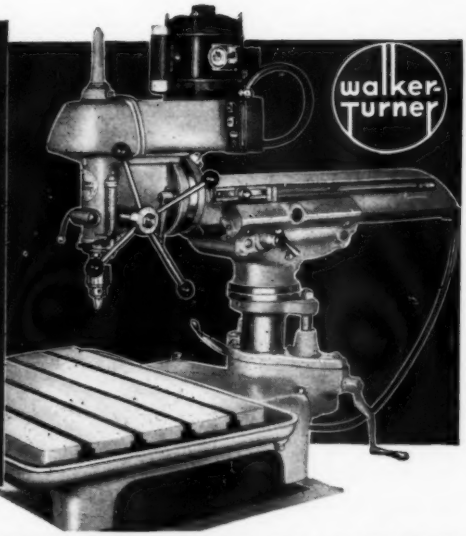
BALL BEARING MOUNTED: sliding ram carried on 8 precision ball bearings with provision for take-up for wear.

SIX-SPLINE SPINDLE: four precision ball bearings. Drive pulley straddle-mounted to eliminate belt strain.

CAPACITY: permits drilling to center of 62" circle. Maximum distance nose of chuck to table 13½". Vertical traverse of spindle 3¼". Column diameter 3¼".

MISCELLANEOUS: drill may be tilted to 45° right or left. Drill press head cast in one piece. Run-out accuracy guaranteed within all industrial standards. Extremely rigid when locked in drilling position. Minimum deflection.



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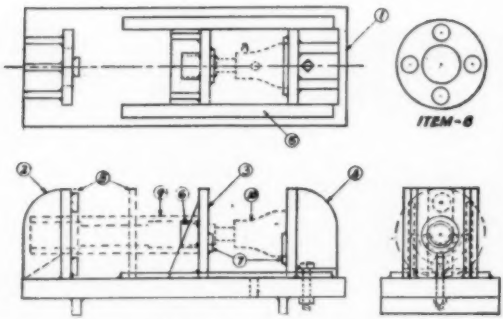


Sketch 5 — Details of press which was designed and rebuilt in less than 24-hours.

can mean to an industrial plant at a critical period. This particular fixture was designed and built in less than 24 hours to avoid tying-up a 250 ton hydraulic press which was in continuous use on a rush order.

It is used to press rings (8) on to a shaft (9), the clearance being such that a pressure of from 10 to 20 tons is needed. Two positions are provided for the anchor assembly (4) for pressing the end plates onto the ends of the shafts. This fixture, flame cut and arc welded, served its purpose successfully with the aid of a 25 ton hydraulic jack, which is common equipment in almost every plant.

This press equipment consists of three small assemblies which are fitted up and welded separately and then applied to the base plate. Considering first the end assembly (2), the welding should be done with bars clamped across the face as it is not machined and must remain as flat as possible. The blocks, of round stock, in which the plate (8) is centered, are chamfered to receive a flush weld and must be square on the end which is welded.

The ram assembly (3) which slides

TABLE VI—WEIGHT AND COST COMPARISON

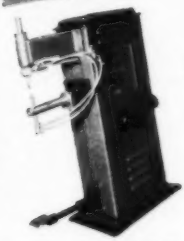
Welded Construction		Castings	
Weight	1229 lbs.		1295 lbs.
Cost of steel	49.16	Patterns	34.00
Burning	4.50	Castings	36.26
Assembling	7.20	Machining	28.00
Welding	10.80	Base plate	31.08
Totals	$71.66		$129.34

MATERIALS NEEDED

Part No.	Part	Material	No. Required
(1)	Base plate	3"x18"x1" OHS	1
(2)	End assembly upright	1½"x12"x14" OHS	1
(2)	End assembly gusset	1"x6"x14" OHS	2
(2)	End assembly gusset	1"x4"x6" OHS	1
(2)	End assembly guide blocks	3"x1" c.r.	2
(3)	Ram assembly upright	1½"x12"x14" OHS	1
(3)	Ram assembly gusset	1"x5"x10" OHS	2
(3)	Ram assembly bottom plate	1"x6"x12"	1
(6)	Shaft support	4" o.d.x3" long pipe	1
(7)	Jack rest	½"x5"x9" OHS	2
(4)	Anchor assembly upright	1½"x12"x14" OHS	1
(4)	Anchor assembly gusset	1½"x7"x12½" OHS	2
(4)	Anchor assembly bottom plate	1½"x7"x12" OHS	1
(5)	Guide Rails	1"x2"x32" OHS"	2

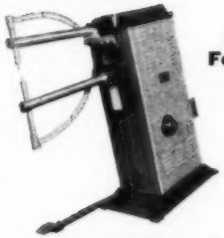
REX

Heavy Duty SPOT WELDERS

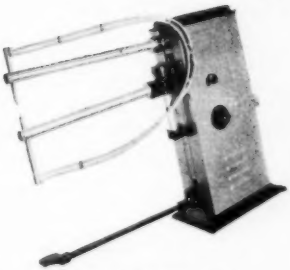


Press Type
Foot Operated

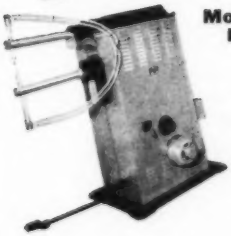
Rocker Arm
Air Operated



Rocker Arm
Foot Operated



Foot Operated
Swivel Lower Arm



Motor Operated
Rocker Arm

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Dyer WELDER AND ENGINEERING Company

7 East 19th Street, Kansas City, Mo.

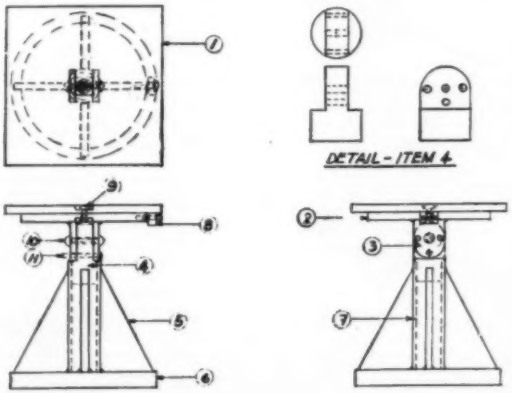
between the guide rails with the expansion of the jack need not have continuous welds except on the inside of the tube (6), which supports the end of the shaft (7). The anchor assembly (4) requires continuous welding and must be kept square to provide a solid base for the jack (10).

After the three assemblies have been welded, the base plate (1) must be checked to assure a true, level, surface and should be sanded to remove all scale, etc., which would hinder the operation of the ram. The end assembly (2) is then put in place and welded. The fillet weld at the bottom of the upright, facing the jack, is the only continuous weld necessary, as this is the point of shear. The gussets are then given substantial tacks to the base plate. The ram assembly is sanded on the base and oiled to facilitate its sliding back and forth. The anchor assembly (4) is then bolted in position, and with the jack laid in the rests, the press is ready for operation. See Table VI for details.

The positioner fixture shown in Sketch 6 is an indispensable aid in welding small assemblies which must be positioned frequently for flat welding, and which do not justify tying-up a large motor-driven positioner. The body consists of the base (6), pipe (4) and gussets (5), and can be made to suit the requirements of the fixture. If it is to be clamped to the floor, lighter materials may be used for the body than given in the list of materials in Table VII.

After the body has been welded, the swivel (4) is inserted into the pipe and welded. The turn table (2) and turn table support (3) are then assembled and drilled to match the holes in the swivel. The top plate (1) and turn table are next riveted (9) just tightly enough to permit turning. The tapping pad (8) is next welded to the top plate and holes are drilled and tapped in the positions necessary. The pivot pin (10) may be either a rivet or bolt for easy dismantling. The locking pin (11) is a rivet. When in use, bolts are tacked to the top plate and the assembly is by means of clamping pads. Table VII gives details.

These examples could be multiplied at length but enough have been given to indicate what can be accomplished. It is to be noted that the cost of the welded jigs and fixtures is in every case substantially less than if a casting



Sketch 6 — A handy welding positioner for the jobs that do not justify use of a large motor driven positioner.

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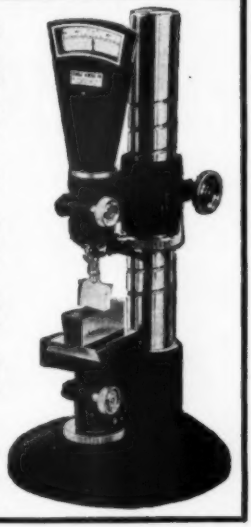

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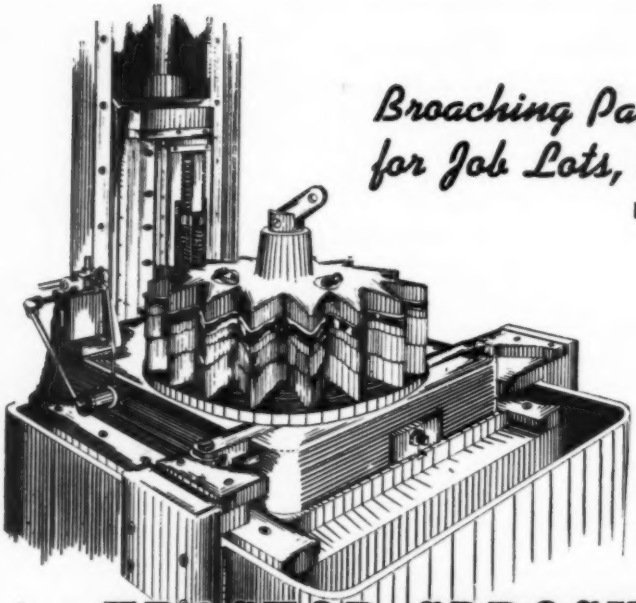
TABLE VII—WEIGHT AND COST COMPARISON

Welded Construction		Casting	
Weight	376 lbs.		300 lbs.
Cost of steel	15.04	Pattern	17.00
Burning	2.70	Casting	21.00
Assembling	3.60	Machining	10.50
Welding	16.20	Top plate	3.40
Grinding	.75	Assembling	.90
Totals	$38.29		$52.80

MATERIALS NEEDED

Part No.	Part	Material	No. required
(1)	Top plate	¾"x20"x20" OHS	1
(2)	Turn Table	¾"x16" diam. OHS	1
(3)	Table support	½"x4"x6" OHS	2
(4)	Swivel	3½"x8" long	1
(5)	Gusset	¾"x7"x13" (makes 2)	2
(6)	Base plate	2"x18" diam. OHS	1
(7)	Body	3½" I.D.xH. pipe 16" long	1
(8)	Tapping pad	1"x2"x2" OHS	1
(9)	Rivet	1"x4"	1
(10)	Rivet	1"x5"	1
(11)	Rivet	⅝"x5" GRS	1

were used. And in every instance except the last, the weight is also less. Another advantage which should not be ignored is that with welded construction, the work may be done in the shop without the delay usually incidental to having it done outside, as would often be necessary with castings, unless a foundry were associated with the plant. Even so, time would be consumed in making the patterns and molds, casting, cooling and machining.



Broaching Pays for Job Lots, too

NUMBER 3

for TRACTOR SPROCKETS

The broaching set-up above was developed for cutting the teeth on crawler track sprockets (for tractors, tanks, etc.). Such sprockets may first be roughed out by flame cutting, etc. and then finished to accurate dimensions by broaching.

The set-up shows how this may be done with a single broach by indexing the fixture between cuts. If the production is high enough, indexing can be made automatic.

The sketch and the cost figures which accompanied it, convinced two companies of the economies of broaching "for job lots".

Just another example of how broaching probably can save you, too, time and money—regardless of the quantities involved. In some shops a single flexible Colonial machine does the work of a number of milling machines.

Colonial engineers will be glad to provide you with sketches and an estimate of the cost of doing any particular job or jobs by broaching.

There is no obligation. Just send us blueprints of the parts and data on the quantities involved.

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Changing Tool Holders

By J. R. LONGWELL

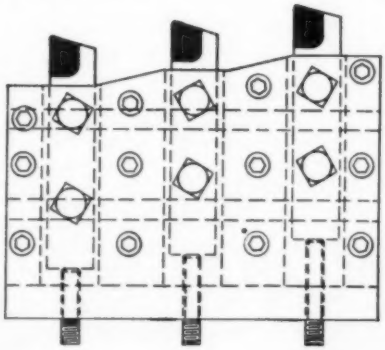
AT a time when all efforts are being directed at increasing output per machine and per hour, one simple possibility seems to have been largely neglected: — the time-wastage involved in changing tools on machines.

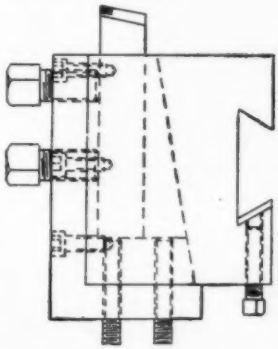
The tool holder has always been a sort of an orphan. In most cases, it has not been the prime responsibility of the machine tool builder or the machine tool user. This is particularly true in connection with holders for machines on which turning, facing, and boring operations, etc., are performed.

With the advent of higher speed machinery, permitting greater outputs, set-up time has become more important than previously, since even the same amount of time lost means a greater percentage of reduction in machine productivity.

The wider-scale use of carbide tools with their longer life between grinds has served to offset the total time loss to a considerable extent, but time for individual change-overs remains the same—if it hasn't been increased—since today we are working to higher degrees of accuracy, requiring more precise tool adjustment,

Again, with a higher and higher proportion of relatively unskilled men operating our machines less and less of actual tool setting is being performed by the machine operators. They just stand around and wait while the tooling is being adjusted. Since there is no superfluity of good tool setters either—their number hasn't increased in proportion to industrial output—the machine operators frequently have to wait until the tool-setter can get around to their machines.





Fundamentally, the ideal approach to the problem would be the elimination of all tool adjustments at the machine. It is doubted whether such an approach is feasible except in rare instances. However it is possible to make a material reduction in the amount of time lost in changing tools, by transferring all major adjustments to the tool room itself.

This can be done by the simple expedient of changing tool holders instead of tools on the machines. Major adjustments then can be made in the tool room, leaving only minor "touch-up" adjustments at the machine for the tool setter.

With the broader usage of cemented carbide tooling, this method of handling the machine automatically has become quite simple, since grinding of such tools is already being centralized in the tool rooms in most plants.

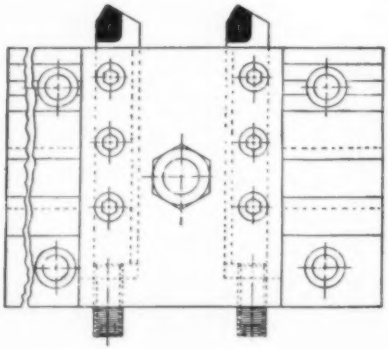
Surprisingly enough, little thought has been given this subject by industry in general, probably because the vast majority of machines are not equipped with quick - interchangeable holders. Such holders, however, require no great ingenuity to design, and are relatively inexpensive to make, while tool holder mounting plates on machines also can be modified in a simple manner to enable their use.

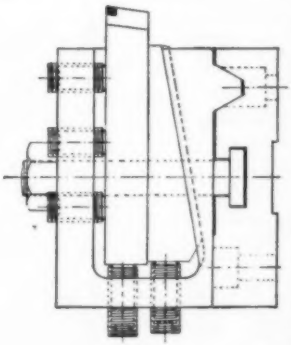
Fig. 1 for instance shows a suggestion for a simple type of quick replaceable tool holder for multiple-point tooling set-ups. Such a tool holder may be attached in the conventional manner to the standard tool holder mounting plate on the machine.

It will be noted from the drawing that the necessity of using shims to adjust the tool to cutting height is eliminated through employment of a screw-adjusted wedge. The tool is raised to the correct height with this wedge, and then is clamped tight with the set-screws shown. This permits adjusting for in-and-out position of the tool on the machine as well as in the tool room.

Where only one or two holders are used on a machine, either one can be unclamped and slid off the end of the dovetail without interfering with the other. If a larger number of holders is required, then there is a practical difficulty in that, to remove the holders in the center, tool-holders at the ends have to be removed first.

This difficulty may be overcome by a slightly different type of tool holder as suggested in Fig. 2. Although for this type of holder a special mounting plate is required on the machine, the mounting plate itself is simple and low in cost to construct and install. The





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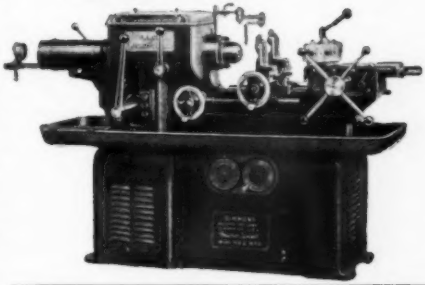
"We have turned out thousands of these parts, holding the outside diameter to .0005 tolerance, using only a stock model roll tool. These parts also are reamed to a .001 tolerance and held to length within .005".

Another important factor is that our delivery schedules are excellent!



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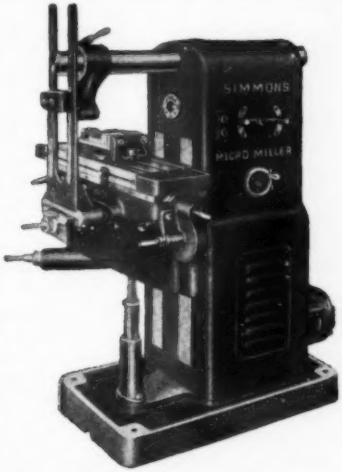

▶ RANGE OF FEEDS: Longitudinal, 34"; cross, 8"; vertical, 18"; work surface of table, 27"x8".

SIMMONS

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FIGURE 3

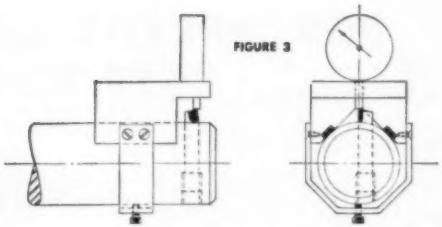


Fig. 3 (Top) shows a simple gage for setting a tool to correct cutting diameter in a boring quill.

FIGURE 4

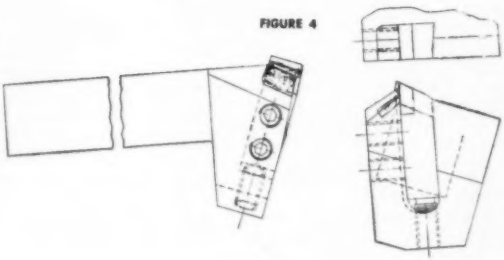
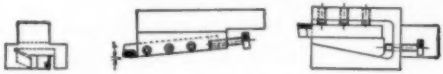


Fig. 4 (Center) suggests the use of a "standard" removable tool mounted in the end of a holder to facilitate changes in the case of hefty tools.

Fig. 5 (Bottom) presents a possible design for use on turret lathes, etc., for the mounting of single tools.

FIGURE 5



holder is then located by means of the V-groove in the special mounting plate.

The tool holder here is quite similar to that shown in Fig. 1 in so far as locating the tools is concerned. Again, the wedge type of construction is employed to adjust for height of tool, while a second adjusting screw locates the tool for in-and-out position. As shown, the tool holder is clamped through the center, resulting in a necessarily wider spacing of tools than may be desired. In such a case, the use of two holders side by side permits locating tools just as closely together as may be needed.

In both of these holders, tools can be set to cutting diameter and center height in the tool room, immediately following grinding. This may be accomplished most easily through the use of simple gages, such as suggested in Fig. 3 for setting a tool to correct cutting diameter in a boring quill.

The gage consists essentially of a dial indicator mounted on a light aluminum holder in which is incorporated a V-block. To eliminate chance of error due to wear in this block, small hardened steel inserts are provided at the contact points for the quill.

The dial indicator is set to zero through the use of a simple "master gage". The light gage is then stamped on the boring bar or grill and the tool is set to correct cutting diameter by means of the adjusting screw in the boring bar.

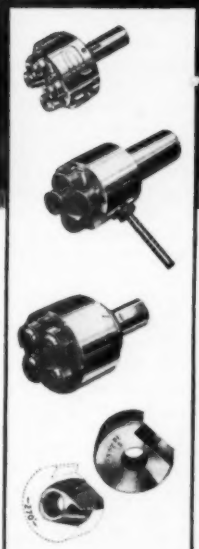
In connection with large turning tools for very large work, there is a possibility of saving a tremendous amount of

Whether in arsenals or in large or small industrial plants, if you have a production job that requires a hollow milling operation, make this comparison—

With a single pointed tool you get one chip at each pass. With a Namco multiple circular cutter head you get 4 chips at each pass. You multiply your output 300% and more. That's the minimum saving in running time alone.

Other advantages: You sharpen a set of Namco circular cutters in the tool room. You check them for uniformity of grind, then ONE simple adjustment in the head brings all the cutters into final position. No time lost fussing with individual tools, no scrap loss in getting started.

If you have been hollow milling the long way, ask for the low-down on Namco Hollow Milling heads for your job. You are working with Time, and time is money.



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"DOUBLE-DUTY" tools, because you hollow mill or thread with the same head . . . simply change cutters and blocks.

time and labor, not only in set-up time but also in tool handling and tool grinding. Such tools frequently run up in weight to some 60 or 80 lbs., involving considerable difficulty in handling and grinding

A suggested way to overcome this is through the use of a "standard" removable tool mounted in the end of a holder. A design along this line is shown in Fig. 4. Again, in-and-out adjusting screws are provided for the tool. For steel cutting, the use of a holder of the kind shown eliminates the necessity of grinding-in a chip-breaker on the tool, since the holder itself will act as a chip-breaker. For this purpose, the front of the holder carries a wear-resisting cemented carbide insert at the point where the chip hits the holder. Note that in the design shown, the tool has been given a negative rake at the tip to direct the chip at the "chip breaker" and prevent its entering into the small space between the tool and the holder. In a design of this kind, the tool can be replaced quickly and easily adjusted. The chip breaker is also "quick-adjustable", since the design characteristics of this breaker may be altered by changing either the rake on the tool or the distance of the holder from the tip of the tool.

Still another type of holder is shown in Fig. 5. This is designed as a possible suggestion for use on turret lathes, etc., for mounting of single tools. Here again, the holder complete with tool would be removed and replaced, rather than replacing the tool alone when grinding is required. This type of holder has a further advantage in that it permits the use of small bits—for light cuts—on large machines, and thus provides greater accuracy under such conditions.

These are just a few suggestions of how this whole subject of tool holders can be approached in a simple fashion to eliminate time loss when it is necessary to change tools. With such holders, time required to change tooling frequently may be a matter of seconds, cutting non-productive time and increasing output per machine and per man.

One more point which might be brought out is that any increase in simplicity of tool changes will tend to keep the operator from trying to prolong the life of the tool beyond the economical dull point—a frequent cause of excessive grinding requirements and even of tool fracture.

Incidentally, if such holders are to be used with carbide tools, dog point screws, or screws with the ends ground flat and square with the threads, should be used. Also, tool holders should be designed or installed with a minimum of tool overhang to reduce vibration—a possible cause of a breaking down of the cutting edge.

Identifying Metal Scrap

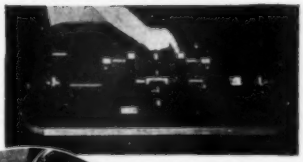
Molybdenum, tantalum, stainless steel and nickel scraps are being identified and separated positively and quickly at Westinghouse Lamp Division, by characteristic color tinges appearing on the different metals under daylight fluorescent lighting.

Sheet molybdenum and tantalum, especially, look alike under normal incandescent light, and cannot be separated by visual inspection. By segregating the scraps into small piles and lighting them with a single 24" daylight fluorescent lamp in a concentrating reflector, the tantalum may be identified instantly by its apparent bluish hue, while molybdenum retains its characteristic metallic color. The method is so foolproof that these materials are now sold separately with a purity guarantee, where formerly valuable tantalum pieces were interspersed with the rest of the mass which had to be salvaged and sold as mixed molybdenum and tantalum scrap.

Recently from salvaged molybdenum having a value of about $700 in its pure state, it is reported that an additional $100 worth of tantalum was recovered through the use of fluorescent lighting.

BIG AND LITTLE JOBS ALL THE SAME TO DoAll SAWS

Below are three tough jobs done at Swanson Tool & Machine Company, Erie, Pa.



Machine Steel Base Plate sawed complete with DoAll Saws

These remarkable band saws, first developed for the famous DoAll Contour Machine, are now available for use on all metal cutting band saws.

For every sawing job, including such hard ones as cold rolled nickel, ductile aluminum alloy, laminated low carbon steel sheets, neoprene, etc.

Tool Steel Lifting Chuck Jaws sawed with DoAll Saws.

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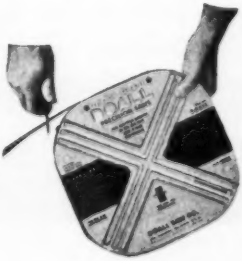
DoAll Saws Come in Special Metal Boxes

For safe, easier handling and storing, DoAll Precision Band Saws are packed in modern metal boxes, with window to show how much saw remains in each box.



FREE TEST
Let our Saw Testing Laboratory experiment with any tough metal cutting job you have, and show you the most efficient and economical way to handle it.

Send for booklet Actual Performance Records of DoAll Saws

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Speed Is Essential

By J. E. BULLARD

IF the ending of the present war is not to be followed by our worst depression, there will have to be a marked increased in production per hour per man. That production must be great enough to provide the standards of living to which our people are accustomed, and in addition, enough more to pay government costs. If government costs mount to half the national income, the average production per man must go up in proportion. If with total government cost 50% of the normal national income (i. e., 50% of what is produced), it is desired to maintain a standard of living equal to that enjoyed when government costs were only 15% of income, it will be necessary to increase average production per man per hour by at least 35%.

In the long run, all government costs have to come from production. There is no way of avoiding this. Those costs can be met by lowering the standard of living and keeping the production per man per hour the same as it has been in the past. They can be met by maintaining the previous standard of living and increasing production sufficiently to meet the increased government costs. The second way is the better and sounder course to take, if it is possible to take it.

To insure that production will be increased, however, it is necessary that a great deal of thought be given the problem at once. The needed research should be done and the required machines and the equipment wholly or partially designed. More production per man, obviously, means higher speed in production. This can be accomplished by means of higher cutting speeds, the elimination of non - essential motions and by other means of saving time.

The maximum cutting speeds practical can be determined only through research. However, we have such a wide range of alloys specially suited for cutting edges and making higher speeds possible that a considerable increase in speed seems possible in the case of most, if not all machines. Higher speeds require more rigid and stronger machines and serve to obsolete older machines. Therefore, if placed on the market as soon as hostilities end, these new machines should help to take up the slack in the machine tool business. To accomplish this, however, it will be necessary to be prepared to build those machines just as soon as conditions warrant.

In practice, maximum cutting speeds are more likely to be attained when there is mechanical feed than otherwise. The man accustomed to lower speeds is not likely to feed the work by hand, on a high speed machine, as rapidly as that machine permits. Habit

Today
NATIONAL DEFENSE PRODUCTION
Requires **SPEED!**
SAVE TIME WASTE!
Use the BARKER Wrenchless Chuck

Don't let wrenching and adjusting waste your production time—keep your lathes working and not waiting. With the BARKER Wrenchless Chuck the usual chucking time is put into actual production.

It can be adapted to any type of work that may be done on turrets, engine lathes, semi-automatic or pipe threading and cutting-off machines. Users everywhere are getting high percentage increases in production. You can get similar results as soon as you put the BARKER to work.

The BARKER Wrenchless Chuck is simple and sturdy in construction. It is compact—requires no accessories to install. It permits bar work to spindle capacity. A quick movement of the lever releases or grips the work. Well adapted for a diversified line, from small brass castings to heavy forgings. Write TODAY for full details.

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is so strong he finds it more or less difficult to take full advantage of the capacity of the new machine. This emphasizes the importance of designing new machines for mechanical feed if it is practical. Even this is not enough. If the machines permit a very considerable increase in speed, it is likely that tables will have to be provided which show the speed suited to different kinds and thicknesses of materials, kinds of cuts, etc.

Obviously, such tables need to be incorporated on the machines, and if practicable, be combined with the speed setting mechanism in such a manner as to show when the speeds are properly set for the work being done. This idea is being used in the case of household appliances to a greater and greater degree. The switch of a multiple heat electric flatiron, for example, has points for silk, wool, cotton, etc., rather than temperature graduations. If a machine has controls which are designed in the same manner, showing when the cutter speed and feed are properly set for each kind of saw or cutter, time is saved and there is no excuse for not using the proper combination.

It is never enough merely to design and build a machine which is capable of the maximum production per hour per operator. It is necessary to make it just as easy as possible to determine the best settings for any given job of work. Otherwise, the maximum speed is not likely to be used as regularly as it should be and the machine fails to accomplish the purpose for which it was designed.

Machines of the future probably will have to be designed for use in connection with mechanical conveyors to a greater extent than in the past. If a machine operator reaches but a short distance with his left hand for the piece to be served to the machine, holds it in

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MIDDLETOWN CONN., U. S. A.

place with his hands while he clamps it in place with a lever operated by his right foot and starts the feeding by pressing a lever with his left foot, he can turn out more work in a day than he can if he has to pick up the pieces from a low level, place them on the machine and feed by hand. If the feed is so designed that he can place new pieces in position while one is being cut, he can speed up production still further. There is a minimum interval between the cutting work on one piece and the cutting start on the next.

Any such arrangements are likely to call for mechanical conveying from one machine to the next. In any case, mechanical conveying saves labor and that means less total labor for the total production of the shop. It will be necessary in every field of manufacture to eliminate all manual labor which can be supplanted by mechanical means, and to speed up the output of each machine if total production is to be increased to a point where government costs can be met and the standard of living be maintained.

A fraction of every unit of production has to go to pay government costs. The higher that government cost, the larger the fraction. If government costs half the national income, then, it is obvious that half the units produced, go to pay government expenses. The manner in which this is accomplished may be obscure because there are so many different kinds of taxes. Yet, if a factory is making chairs and the cost of government is doubled, people will have to get along with a correspondingly smaller number of chairs unless there is a sufficient increase in the number of chairs produced a year per employe of the factory. If the production per employe remains what it has been in the past, people will not be able to buy so many chairs because they will not have enough money left

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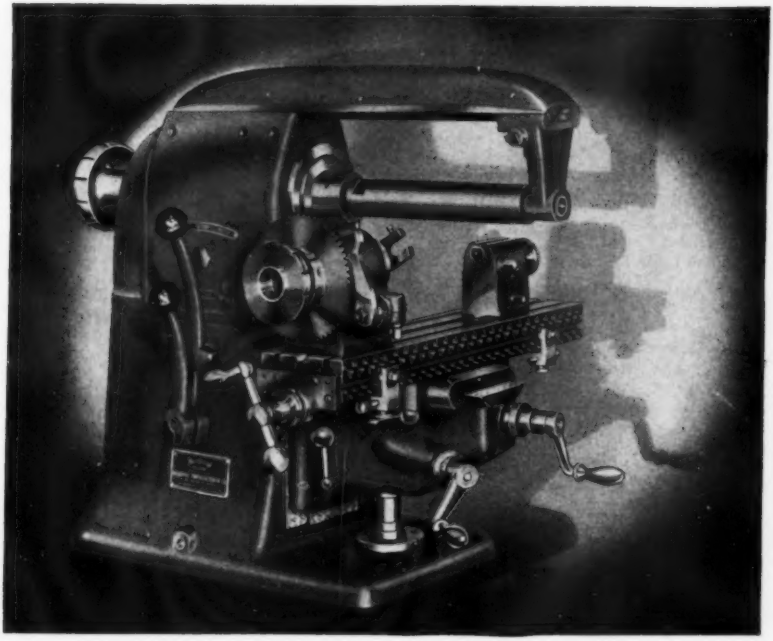

Precision

BENCH MILLING MACHINES

ELGIN TOOL WORKS

Division Of HARDINGE MANUFACTURING CO.

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after paying all taxes. This means fewer chairs can be sold. Since fewer chairs are sold fewer jobs can be provided. The result is increased unemployment and a serious business depression.

If the production of chairs per employe can be increased to such a degree than the increase more than meets government costs, there are enough chairs so people can buy as many as formerly. If the production per employe can be still further increased, people may be able to buy more chairs than they have ever bought before. In some cases this extra buying results from lower prices due to lower cost of production. In other cases it results from higher wages being paid. In still other cases. it results from a combination of both. The real point is that unless the production per employe is increased sufficiently, prosperity cannot continue. If it can be increased sufficiently, there may be greater prosperity than ever before, in spite of increased government costs.

The necessary increase in production is impossible without the cooperation of machine designers. First of all, machines must be available which permit a marked increase in production. These machines must be designed for operation at the highest possible speed. The shop layout, where these machines are used, must facilitate high speed and eliminate manual motions.

The standard of living is determined by the average volume of production per producer. Only that can be divided among the people which is produced. The higher government costs go, the larger the number of people taken out of productive activities and placed in government jobs. These people share in the division of what is produced and if all are to continue to have as much as they had before, production has to be accelerated so there will be enough to go around.

Since no prospect of any marked reduction in government costs appears possible for a considerable time to come, this stresses the importance of attaining greater and greater speed of production. It is being pointed out right along that the speed of war production must be increased. Regardless, of the importance of war production, the speeding-up of peace time production after the war will be of still greater importance. For one thing, enough extra in peace time goods will have to be produced in the shortest possible time to pay for the war production which is now calling for so much effort. Unless this requisite peace time production tempo can be attained, the results may be even more disastrous than war. Upon the shoulders of the machine designers may rest the burden of maintaining prosperity, freedom of thought and action, and even free enterprise.

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SAVE ON REPEAT OPERATIONS

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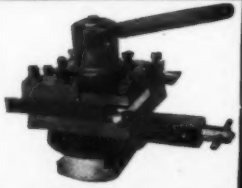
Four positions are provided. Operation is fast, simple, accurate and dependable. Can also be furnished for turret lathes.



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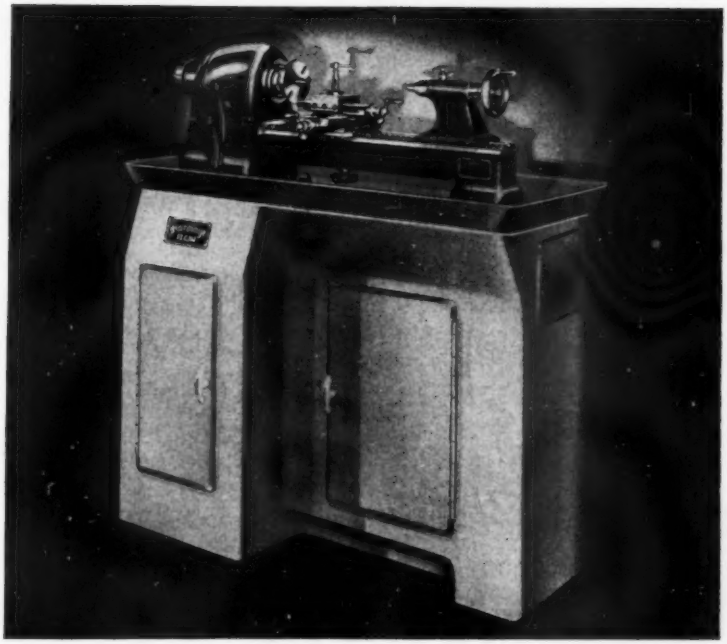

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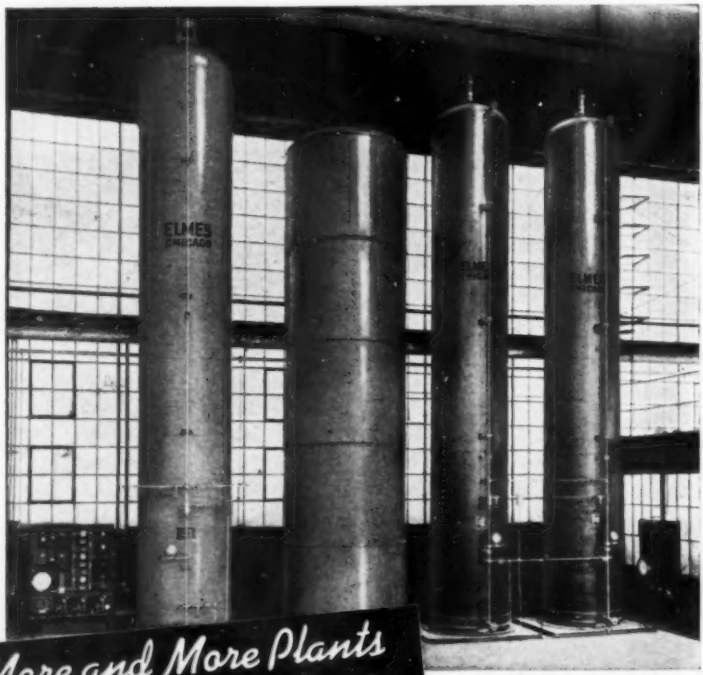

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HYDRAULIC machinery users . . . in rapidly increasing numbers . . . are taking advantage of Elmes pioneering experience in building accumulators . . . and are thereby speeding production and lowering costs.

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ELMES

Selecting Personnel

By RUSSELL J. WALDO

REGARDLESS of how efficient a machine may be, it takes a skilled operator to make it deliver the maximum of perfect parts. Oftentimes a machine is blamed instead of the operator. Many a machine has in this manner received an unjust "black eye," and the maker has lost the sale of others when his machine was perfectly "O.K."

I was in a shop on one occasion when the superintendent was "telling a machine salesman off" on account of the supposed inefficiency of a certain machine. He even added that a new man had been employed who had operated one of these machines several years. The salesman, representing a rebuilt machinery house, listened to the complaint. Then he stepped over close enough to observe the operator at close range.

The salesman was a skilled operator himself and asked for the privilege of taking over. Within the next few minutes he made adjustments to tools, cams and even gears until every operating part co-ordinated properly. The machine, a multiple spindle automatic was found improperly tooled for efficient operation. The salesman soon proved that the machine itself was not at fault, but rather the operator who had set it up.

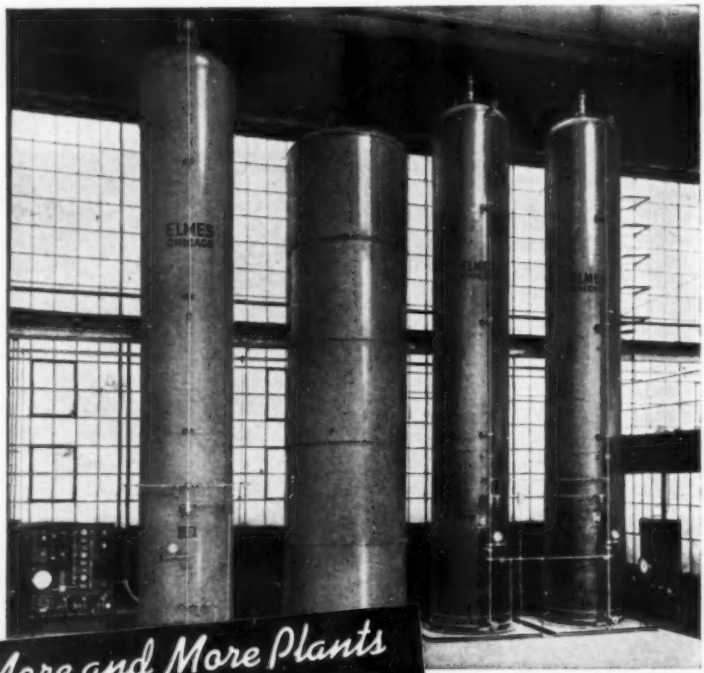
This was just one case of many I have seen where a man had oversold himself to the superintendent. A considerable amount of stock had been ruined by this operator who lacked skill in setting the machine, although he was receiving the pay of a highly skilled operator.

The superintendent recalled that the man had been hired on a busy day and he couldn't remember much about the replies to the questions asked.

The same condition exists in numberless shops today where the superintendent hires the men. It occurs in many shops where men are hired in an employment office. There are many shops with elaborate employment offices that can not pick skilled men for given machines. True, they ask a lot of questions but it is the scope and nature of questions which reveal the capabilities of the men.

At an automotive plant some years ago, I was in charge of interviewing and placing men and developed specific questions for almost every sort of job and machine. The applicant really had to know his machines to answer the questions. He could not bluff his way through.

I learned that many a shop superintendent has hired a hand for a given machine, hoping that once he was on the job, he might develop and take the place of a highly skilled operator eventually.



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EXCELSIOR No. 14 ANGLE ROLLING MACHINE

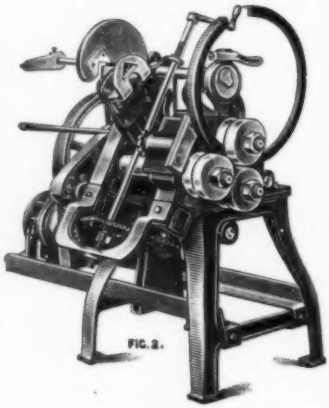

FIG. 2.

Capacity 2x2x¼" Angles. All the rolls are direct driven avoiding slipping of the material between rolls, which are operated by the oversize Excelsior friction clutch. Write for Price and Testimonials.

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Almost invariably, the result was the same. The man ruined a lot of perfectly good stock in proving that he was no substitute for a skilled operator. No progressive superintendent would perchase a small size machine when he knew that a larger machine was necessary. This same superintendent though may hire a man with little skill and experience and expect him to deliver workmanship of a high order. It is true that these men sometimes come through because of persistence or luck. But the cases in which they do not are more numerous and some superintendents do not seem to realize what is happening until much stock has been wasted and perhaps a machine may be damaged.

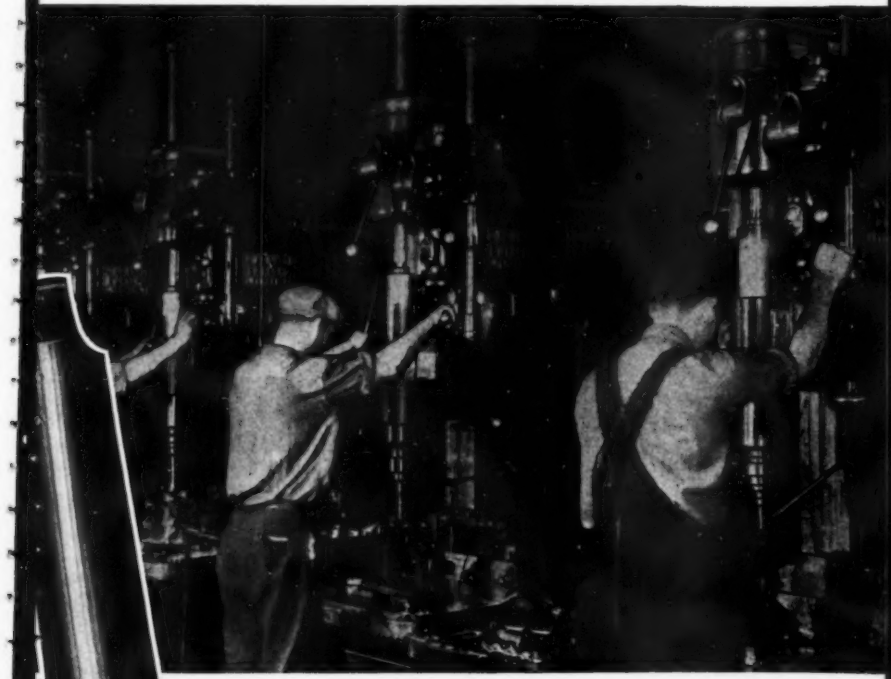
Skilled men and machines, bought upon exacting specifications are equally important in the profit-making of any shop. It requires both to make a profit. Today, raw materials are becoming scarce and can not be wasted. It requires some stock to set up a given job. That waste can be reduced to a minimum only through the skill of the man who is setting-up the job. And I might mention that there is no oversupply of skilled operators today.

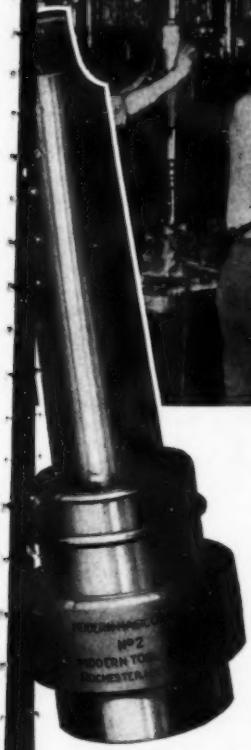
The builders provide machines that operate at peak efficiency if properly set-up. When the machines were sold and promises of performance made, the promises contemplated skilled operators. The superintendents must realize that novices can not turn out the same amount of perfect stock as skilled operators.

The foreman or superintendent who knows both operators and machines, can formulate questions in such a manner as to reveal from the applicant's answers, much valuable information as to his skill and experience.

The interrogator should visualize the machine in his own mind and ask specific questions. He should discuss

Keep Your Spindles Revolving with MODERN-MAGIC CHUCKS





Revolving spindles are producing spindles—and here's the way to increase the revolving time of your spindles and get more out of your present machine tools.

Equip each one of your revolving spindle machines with MODERN-MAGIC Chuck and Collet equipment and cut down tool changing time. On your turret lathes too, the use of MODERN-MAGIC Chucks virtually adds extra stations to your machines.

Write for Bulletin M-101 and find out how you can increase your output with your present machine tool equipment.

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GRINDING AND LAPPING EQUIPMENT FOR COMPLETE MAINTENANCE OF CARBIDE TIPPED TOOLS, ALLOY AND H. S. S. TOOLS

$122.00 Equipment as shown including diamond lap, 60 grit wheel and 110 V., 60 Cyc., A. C. Motor.

Delivery from stock as above.

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1750 R. P. M. — 6"x4½" WHEELS
PRE-LOADED BALL BEARINGS.

ACCESSORY EQUIPMENT FOR GRINDING CHIP CONTROL GROOVES. CUTTING CARBIDE TIPS AND SHARPENING TWIST DRILLS.

WRITE FOR BULLETIN 409

T. C. M. MFG. CO.
HARRISON, N. J.
SINCE 1910

actual problems of set-up or operation of the machine, and all superintendents should know a lot of good problems.

In a Cleveland shop one afternoon, the foreman explained that he had five men in his department who needed constant supervision, but he really hoped that in time they would come through. He had selected every man in his department and reluctantly admitted he had misjudged the ability of some of them.

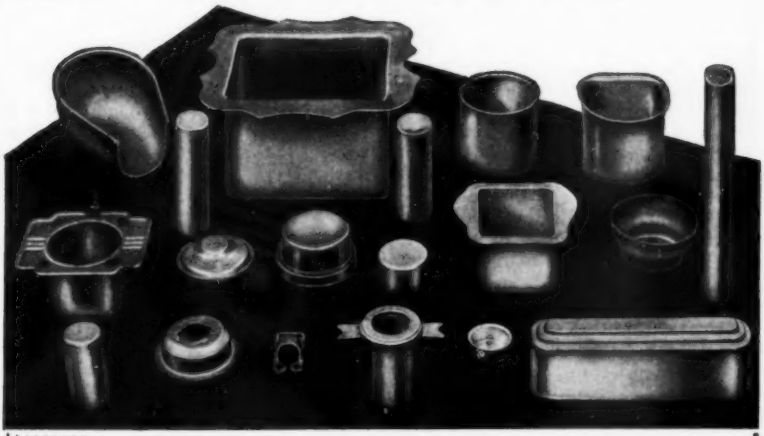
This is a single instance. There are many cases in which department heads have more or less taken the applicants' stories, hoping that the men would make good. In many cases, a little more time and care in the selecting process would have eliminated some of the less efficient workers.

Until a few short years ago, "grinder hands" were requisitioned regardless of the degree of skill required. There is a vast difference in requirements of grinder operators, even in the production departments. Rough grinding is the logical starting point for every grinder operator hired, promoting him to closer jobs as he shows capacity for advancement.

Grinders at a large industrial plant where I worked during World War I were producing grenades and other ammunition casings which were machined to very close limits. The job presented a problem that was far from easy. The night shift used young fellows while the day shift employed young women. The average operation was fully automatic and its success rested largely on tne skill of the set-up man. Despite that fact, operators could ruin a lot of material before it could be discovered. In such operations, proper use of gages is very essential if waste is to be prevented. It is important that grinder operators under such circumstances should be extremely precise and careful.

I recently enjoyed the comment of a

DEEP DRAWS at Low Cost



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department head in Detroit. He very casually discussed the subject and pointed out that he believed he "could get a lot more out of a highly skilled operator and a bum machine, than he could out of a good machine and a bum operator." To a certain extent that is true. However, some of the less skilled operators can be converted into skilled operators faster and more economically than poor machines can be converted into good machines. For real results, good machines and good operators are required, even though time must be spent in training the operators. The problem right now is to train a production army in the least possible time.

During the other war, I hired some machine operators who were discredited by former employers, yet in our shop they proved to be very efficient.

I recall distinctly that after hiring about a dozen operators from one shop (including turret lathe and automatic screw machine operators) the foreman of that same shop was added to our screw machine department. He was hired as night foreman, and within two months was on day turn with the dozen of his former workers.

This foreman one day in confidence told me that he had been handicapped with the worst lot of machines in his former shop that a man could be expected to use. He had tried to have the machines repaired, at least with new bearings and tool holders, but had never been able to put it over. At last in despair he quit.

I recall several shops in which the new workers are taken in charge by skilled operators for a day or so after arrival. They are taken through the paces, step by step as though they were novices. They are shown everything about the shops, methods, machines themselves, toolrooms and given a proper start. During this process, the skilled operators notice obvious weaknesses of the men, and this information is passed along to the set-up men and foremen who can make suitable provision. Undoubtedly these shops have lost less through these new men than other plants where the superintendents merely took the new men to the machines, pointed out tool cabinets, the toolrooms and turned the newcomers loose.

It is often asserted that there isn't a machine in any shop that doesn't operate differently than the same make and size of machine in another shop. This may be from wear, fit of vital parts, etc., but it is there just the same.

It is imperative in these times of high pressure defense production that machines and operators must be selected that can produce the maximum in the minimum of time, with a minimum of waste consistent with good workmanship. Much of the finished material which just "gets by" the inspector, should be better and would be if the operators were better operators.

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Splines Without Backlash

AN innovation in the machining of splines on automotive propeller shafts is reported to permit the production of such splined parts in large scale production with no measurable backlash.

The new process essentially consists of an adaptation of the "crossed-axis shaving" process (extensively used in producing accurate gears) to the finish machining of the "splines," while equivalent accuracy of the female part is obtained through the use of high precision broaches (Fig. 1).

According to Universal Products, the saving made on the hobbing operation alone offsets the expense of the shaving operation.

To permit the use of this type of equipment, the "splines" are actually developed involute teeth. In addition to permitting the use of the crossed-axis gear shaving process, the tooth design is asserted to provide a stronger assembly, since increased width at root of the "teeth" increases resistance to shear and the increased contact area increases the life of the splines.

Furthermore, if wear does occur, noise will be minimized, since any relative movement will be largely in the form of a "rolling" action, as with involute gearing.

From 26 to 38 "splines" are used on the 3 standard sizes of shafts produced, giving the appearance of a series of serrations around the stub end of the propeller shaft. Diameter of the latter is around 2".

To provide maximum accuracy of tooth profile, rack type "Michigan" gear shaving equipment is used (Fig. 2). The machines are the series 900 type, in which the "gear" is mounted between live centers. A generating rack is reciprocated in mesh with the "gear" while the head of the machine, carrying the work, is fed downward.

Fig. 1— Accuracies to within 0.0001 to 0.0002" are being obtained on involute splines for universal joints—through use of a new machining process for splines.

Fig. 2—Series 900 Michigan rack type gear shaving machines finish the splines on universal joint yokes made by Universal.

With this type of equipment, accuracy of tooth profile is almost entirely dependent on accuracy of the serrated blades of the cutting rack.

A production rate of some 70 to 80 pieces per hour is obtained in spite of the extremely high accuracy required. The rack itself has approximately 100 teeth, giving from 3 to 4 revolutions of the part for each stroke of the rack. In practice, some 12 to 16 strokes of the shaving rack are used to finish the splines. Two Michigan machines are used, identical in design to take care of production requirements on all sizes.

Incidentally the splines are so designed that the same rack can be used for finishing all parts, all splines having the same pitch and pressure angle. The rack differs from conventional gear shaving racks mainly in the large number of blades required for the fine pitch.

Prior to the shaving operation, the stub ends are semi-finish hobbed in Cleveland single-spindle and 8-spindle rotary machines. (Fig. 3). Each shaving machine takes care of the output from 4 or more single spindle hobbing machines. Mitco 3-thread hobs are used. Due to the use of shaving equipment for finishing, Class B hobs can be utilized. The hobbing shape of "spline" formed is roughly indicated by specifications for the hob which, for the 38 spline stub end, is 21.111 pitch, 20° pressure angle, 2° 14′ thread angle and lead 0.192″. Feed is 0.10″ per revolution of the work—length of splined end is approximately 3″.

To check the spline dimensions in production after both hobbing and gear shaving operations, an 0.080″ diameter wire is inserted between the teeth on opposite sides of the spline, the size being such that the wires do not "bottom" in the splines. Following the hobbing operation, the limits are from

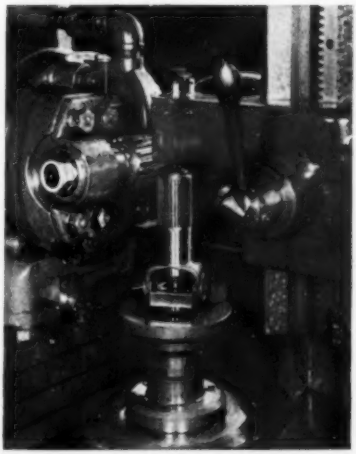

Fig. 3 — Splines are semi-finish hobbed on Cleveland single-spindle machines. 8-spindle rotary hobbing machines are also used for this operation. Hobs are Mitco 3-thread type. Due to the use of shaving equipment for finishing, Class B hobs can be used.

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1.915 to 1.917" across the wires. After the shaving operation the limits are from 1.9075 to 1.9085". Actually the limits are much closer than these figures in both cases, due to the contour of the teeth on the splines, which multiplies any variation in dimensions several times. Accurate gaging of the tooth dimensions shows that they seldom vary more than 0.0001" and never exceed 0.0002".

The mating part—the propeller shaft end, is broached to similarly close tolerances. This operation is performed on a broaching machine, equipped with three broaches and rotary table, as shown in Fig. 4. Broaches are Colonial hardened and ground precision high-speed steel type and successively broach the hole, semi-finish and finish the splines. This part when assembled over the spline, slides smoothly from end to end without measurable backlash or "wobble." Due to the method of producing the parts, the type of fit obtained is identical regardless of the relative rotational positions in which the mating parts are assembled. The fit is frequently checked with master internally splined gages to maintain this condition in all shaft assemblies produced.

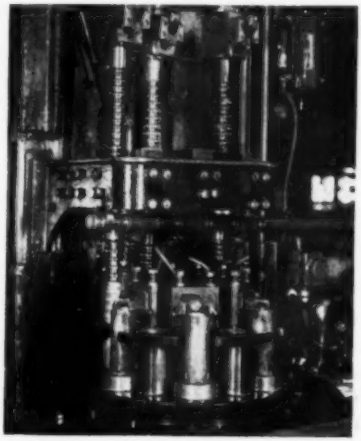

Fig. 4—The propeller shaft ends which mate with the splined ends of the universal joint yokes are broached to similarly close tolerances. Three Colonial hardened and ground precision high-speed steel type broaches successively broach the hole, semi-finish and finish the splines on a rotary table.

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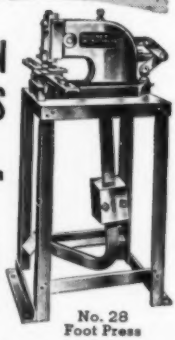

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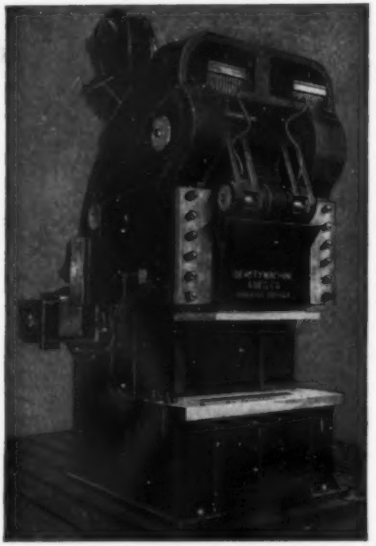

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	No. 16	No. 16A	No. 16B
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Face of slide, front to back	24"	26"	26"
Die space, slide down	20"	20"	20"
Stroke; Standard	3"	3"	3"
Maximum	5"	5"	5"
Face of table, right to left	53"	60"	66"
Face of table, front to back	24"	26"	26"
Capacity	700T	850T	1000T
Strokes	40	35	30
Depth of throat	15½"	15½"	15½"
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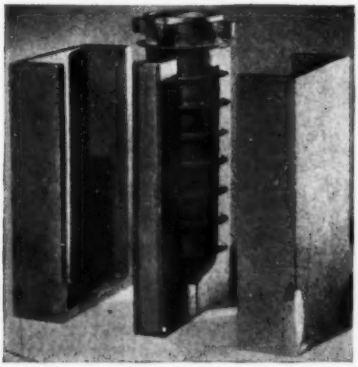
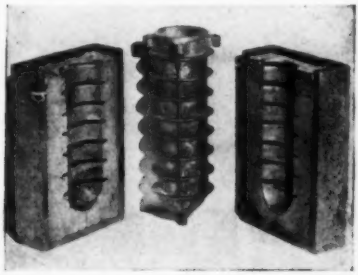
Inexpensive Chuck Jaws

A METHOD of reducing the cost of making chuck jaws for holding irregularly shaped pieces, through the use of a low-temperature-melting bismuth alloy, is becoming popular in many metal-working shops. It is asserted that because of its low melting temperature, this metal — known as Cerromatrix — can be cast against forged metal parts, die castings, rubber, wood and most molded plastics without burning or warping the piece. Its hardness and the fact that it expands slightly on solidifying are added advantages.



It is claimed that these chucks will stand up for long production runs, having been used over 50,000 times in many cases without appreciable wear. The chuck jaws shown have been made by casting the alloy into a steel or brass retaining shell. Note in Figure 1 how the die casting is held in position by two wooden spacers. These spacers are made by nailing two wooden strips to a thicker center piece, leaving a shallow groove the length of the spacer. This groove is filled with a babbitting clay and the spacer pressed against the die casting to make the impression in the clay. The die casting, spacers and retaining shells are then lined up as shown in Figure 1 and the shells are brought against the spacers and clamped in position. Sufficient alloy is melted to fill the holder, taking care to stir well during the melting. The pouring temperature is between 300° and 350° F.

After the alloy has solidified, the clamps are removed and the completed chuck jaws are shown in Figure 2. The wide spacers between the two halves of the brass holder during pouring have prevented the cavities in the jaws from being any deeper than necessary to hold the piece firmly during machining. The spacers should be thick enough to keep to a minimum the movement necessary in opening and closing the jaws.



The process is just as simple as explained here. In many instances, expensive chuck jaws requiring a week or more to make by conventional methods, can be made in the manner described, quickly and inexpensively.

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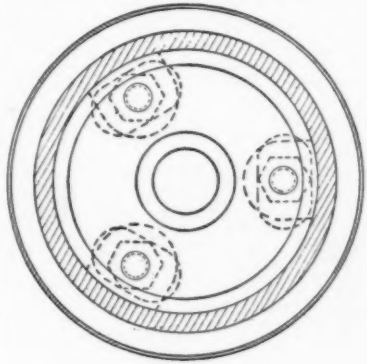
Universally Adjustable Eccentric Chuck

By Paul Grodzinski

In the so-called cutting machines for the roughing of diamonds for ornamental and industrial purposes, an interesting eccentrically adjustable chuck is employed which may perhaps also be of advantage for special metal or wood turning operations, when workpieces of varying eccentricity and varying position of the center are demanded. It may be said that the usual eccentric chuck can only be adjusted for a distinct position of eccentricity to the axis.



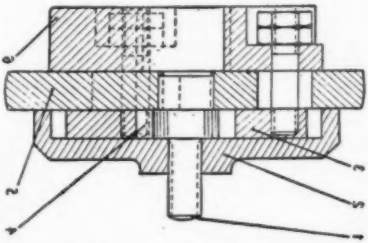


Fig. 1 shows cross-section and view of such a chuck which is adjusted by light blows against the rim of plate 5, with a stick or a bronze hammer. The component 6, consisting of a round or flanged disc, is tightly screwed on

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the spindle of the lathe. It contains three holes at equal distance for reception of the stud-bolts 4. These are fixed by threads in the circular plate 3. Between plates 3 and 6, another movable plate 5 is arranged. The bolts pass through extended holes which allow free motion of plate 5 in a distinct range. A coverplate 2 is so arranged that it fully protects plate 3. Plate 5 and coverplate 2 are connected by a screw bolt 1 which serves simultaneously for the reception of a special chuck for the workpiece to be machined. Coverplate 2 is usually made of brass. The plate 5 has sometimes a smaller width and has a rounded rim which is usually hardened.

To operate satisfactorily the chuck has to be made with high accuracy. In particular the thread on flange 6 must be very accurate and tight fitting. Plate 5 has to rotate absolutely in a plane vertically to the spindle; therefore in some machines flange 6 is made of one piece with the lathe spindle, thus avoiding any inaccuracy due to incorrect running. The counternuts on bolts 4 serve to adjust the chuck to the required degree of rigidity. The tightening of nuts is seldom necessary in service. Some grease has to be kept between the sliding surfaces of the chuck.

Summarizing, the parts shown in Fig. 1 are:—(1) Screw for the chuck and for the fixing of coverplate (2) with adjusting plate (5); Intermediate plate (3), rigidly connected with flange (6) by means of three screw bolts (4).

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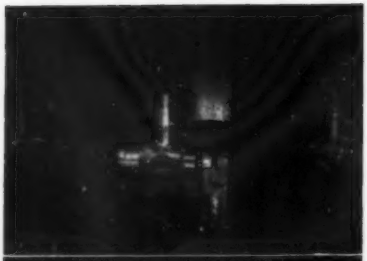

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Ingenuity Plus Welding

By Arthur Havens

I am at a loss to know how to explain the surprising number of ingenious gadgets that are made by welders. Whether this is due to some special inventive ability or to the flexibility of the process in general I do not know. However, the fact remains that in every shop I visit, the same condition exists and most of the shop oddities are all welded.

Who would think of an all welded hand truck? Well, some one did. A fleet of them is doing their daily bit in a small railroad shop in New England. There is a little story attached to the making of these all welded trucks, As the old saying goes, "Necessity is the mother of invention." The old wooden hand trucks in the shop had become so dilapidated that the men complained about using them, arguing they were unsafe. This railroad was in receivership and had no money to spend for new trucks, so the boss welder, knowing full well the conditions, sought permission to fabricate trucks from pipe and plate. He embodied a number of rather novel ideas in the completed article. I will explain them so that any one confronted with such a problem may do likewise.

For handles, he used two pieces of inch pipe five feet long with a slight bend about 10" down from the top end. These handles he laid on the bench and adjusted them so that they would be central and the proper distances apart, i.e., 14" at the bottom and 20" at the top. Five cross pieces were then welded in, spaced at convenient inter-

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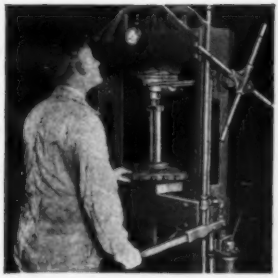

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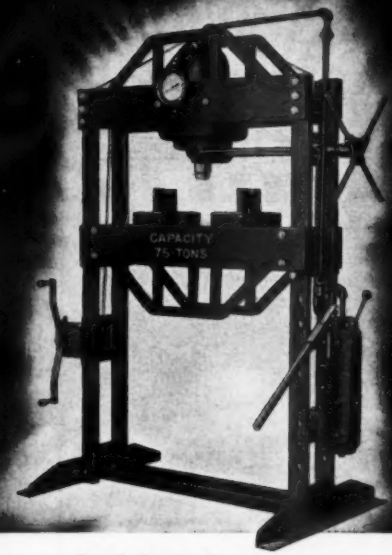

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vals. These were of half-inch pipe. The nose piece was simply a piece of half by two, drawn down on one side to a sharp side. This was welded to the bottom ends of the pipe.

Next a piece of ¼" plate was welded to the back of the handles to stiffen them and to give the distance for wheel clearance.

Then the problem of wheels faced the welder. Search as he might, no where could he find any wheels. Deciding that he must fabricate them from plate he set to work, flame cutting discs nine inches in diameter. He made the web or center of the wheel using ⅜" plate. Two by half inch soft steel rolled to fit the discs served for tires. The hubs were made from 3"x4" steel tubing, bored to take a pair of second hand ball bearings. Welding this assembly together with coated rod made a novel and practical wheel.

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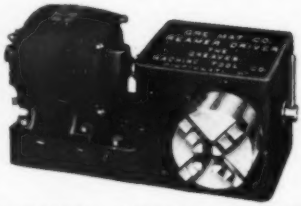

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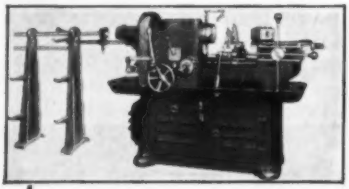

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Do you have trouble getting the work piece off the chuck QUICKLY after the grinding? Do you have to hammer and pry . . . waste time . . . damage the chuck?

Then you need

NEU T ROL

Magnetic Chuck Control to save you time and money

Neu-T-rol RELEASES THE WORK PIECE and DEMAGNETIZES AS IT RELEASES

It speeds up your production
. . . dispenses with damage to chuck
. . . eliminates chuck resurfacing
. . . prolongs life of the chuck
. . . saves operator's energy
. . . prevents injury to him
. . . pays for itself in short order.

NEU-T-ROL Motor-Controlled Unit — for Remote Control, if desired.

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It gives complete information about simple Neu-T-rol installation on grinders in work, or for new grinders before delivery to you.

ELECTRO-MATIC PRODUCTS CO.

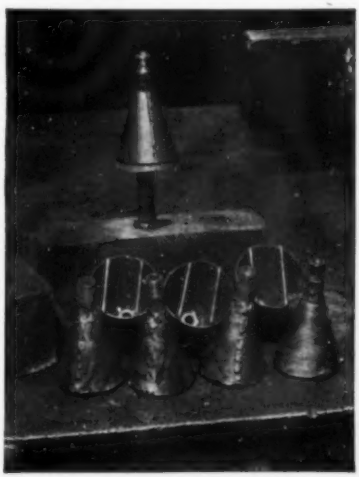
Also Makers of Rectifiers

4024 N. KOLMAR AVE., CHICAGO, ILLINOIS

ings and the hole in the end of the hollow staybolt iron plugged. A grease cup was welded in the center. With this arrangement, both wheels could be greased at the same time. A large washer was welded on each end to hold the wheels in place. The assembly, so far, was placed on the bench in its normal position and tacked to the bench, the wheel and axle assembly as placed in position and the whole thing welded solid to the frame. Two ½" U irons were welded to the back of the handles to act as rests and the job was complete, making a sturdy, easy running and economical hand truck.

Fabricated Oil Cups

A few years ago during the darkest days of the depression, at a small terminal on a railroad that was suffering from financial malnutrition, the stores department was found to be out of oil cups. Again the foreman turned to the welders with a plea for something to serve the purpose for the time be-



ing. The resulting cup not only filled the bill during the emergency but is still in service along with many hundreds of others that have been made

STEP UP PRODUCTION QUICKLY

With this Complete Line for Motorizing All MACHINE Tools

Increase your production capacity quickly and easily with this complete line for motorizing all **machine tools.**

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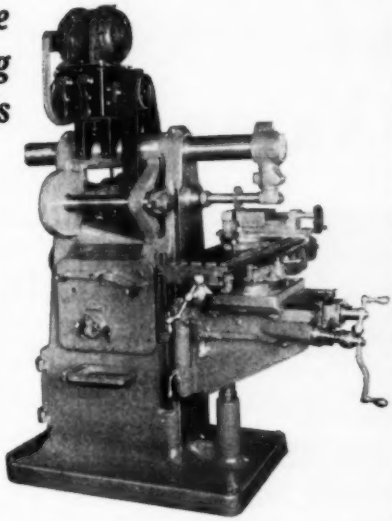
GUARANTEE Turner Uni-Drives are fully guaranteed for one year. They are subject to return for full credit within 60 days if not satisfactory.



SPECIAL APPLICATIONS

The Turner Uni-Drive can be adapted to many special applications. 3 to 6 speed Selective Sliding Gear Transmission available. Submit your problems on special applications to us for solution and quotations.

A FAST SELLING LINE FOR WIDE AWAKE DEALERS

SOLD THROUGH DEALERS IN MOST CITIES.

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WITH FOUR-SPEED SELECTIVE SLIDING GEAR TRANSMISSION

Undoubted Value

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CHROME PLATED GAGE BLOCKS

the only remaining question

ACCURACY?

AND WE HAVE IT !
in the degree required

A perfect combination — the virtues of CHROME PLATE plus the accuracy you need.

DEARBORN GAGE COMPANY

"Originators of Chromium Plated Gage Blocks"

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and used since. In fact, they are now standard on all lead truck, trailer truck and radius rod boxes. This simple cup is nothing more than a piece of 18 gauge black iron rolled into a cone two inches long and 1½" wide across the top. The bottom is cut to fit at the O.D. of a ¼" nipple. Several ¼"x2½" nipples are sawed in half, each half serving for one cup. These are welded to the small ends of the cones. Two pieces of ⅛" rod are welded across the top to keep the curled hair from falling out. The accompanying illustration shows a group of the all welded cups and a simple jig for welding them.

Super Heater Flue Rolling Extension

It had always been the custom in a railroad shop to roll the superheater flues on the fire box end with a hand roll. This was necessary because of the cramped quarters in the fire box. One day while watching the boiler maker and his helper sweat and strain on the big roll, a welder suggested that they weld two air motor collets to a length of 1½" pipe, making the pipe long enough to reach from the flue sheet to the deck of the cab outside the fire-box. Willing to try anything to ease this burden, the boilermaker obtained a collet to fit the roll and one to fit a large air motor and the pipe and had the welder weld the assembly together. Two helpers were stationed on the deck to operate the motor and the boiler-maker stayed inside to guide the roll. Needless to say, this was a vast improvement over the hand method and has proven to be a great time saver as well as a back saver.

Contrary Packing Removed Easily

That doesn't even sound logical does it, and yet it is true. To a 12" length of ¼" steel welding rod is welded a large wood screw, first removing the head from the screw. On the other end of the ¼" piece is fashioned a ring about 1½" diameter or if the maker prefers, he can weld on a straight short piece of rod for a T handle. This tool is screwed into the contrary packing and with a sharp yank on the handle,

2 NEW 8-PAGE FOLDERS

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* Busy as we are, meeting the skyrocketing demand for more and more Boice-Crane tools, deliveries — all types — are good to prompt.

Write TODAY for them and unload many of your tooling headaches right here NOW! Expand production easy, on drilling, tapping, straight and contour cutting jobs with Boice-Crane Drill Presses and 8-speed Metal Cutting Band Saws. No long delivery delays!

1

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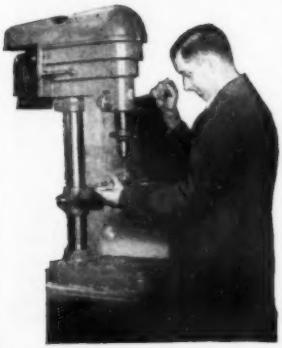

There's a world of help and valuable information for you in the new Boice-Crane Drill Press Folder! 64 different models, and parts for making special purpose machines, to solve a host of tooling jobs. Prices low—and what punishment they take!

2

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Manufacturers of Hand, Machine Screw, Chip Driver, Pipe, Nut, Stove Bolt, Boiler, Pulley, Staybolt, Tapper Taps, Serial Sets, Interrupted Thread, High Speed and Alloy Steel Taps, Ground Thread Taps.

Also a complete line of Round Adjustable Dies.

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A DIVISION OF THE NATIONAL TWIST DRILL & TOOL CO., DETROIT, MICH.

GRIT-CUT
ABRASIVE CUTTER

Designed for tool rooms. Can be utilized for light production. Two convenient sizes for mounting on bench. Legs supplied at an extra cost. An inexpensive cutter costing only

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Does quick and accurate cutting at minimum cost. No job too hard for Grit-Cut.

For quick repairs the cartridge type spindle can be removed and assembled spindle substituted.

The No. 6 machine capacity is 1" solid or 1½" tubing. Size of wheel is 6". Motor is ¾ h.p., 3450 R.P.M. Spindle speed 10,000.

Let us send you complete details.

WILLIAM BOUGHTER
Whitehall Rd. near Township Line, Norristown, Pa.

out comes the packing, saving another mechanic from nervous collapse.

Removing Loose Driving Wheel Keys

Removing loose driving wheel keys in the engine house often presents a rather difficult problem, but here again a little thinking plus a willing welder and the job is made simple.

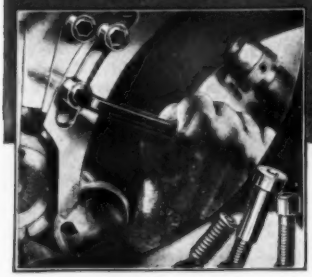
A bolt with a body size slightly smaller than the key is beheaded and scarfed for welding. This bolt is welded to the key with the threads protruding. Over the end of the bolt is placed a piece of tubing or several washers leaving just enough for a full nut. As the nut is tightened, the key will be forced to come out and it is a simple matter to add washers till the key is completely removed.

All Welded Ladders Made From Pipe

Here is an item that has saved many dollars, because once a pipe ladder goes into service, it is there permanently while the old type wooden shop ladders have to be replaced often.

These pipe ladders are made 10 and 12 feet long. The side pieces are made from ¾" standard weight pipe and the

FOR SPEEDIER HOLLOW SCREW SET-UPS



ALLEN KEY SETS keep hex keys handy all the time! . . .

These compact Allen Key Sets save time wasted in hunting after the correct size hex key for hollow screw assemblies, adjustments or replacements. With Allen Key Kits and Key Islands you have readily available strong, accurate keys *where* you want them, *when* you want them, in sizes to fit most standard hollow set, cap and shoulder screws and pipe plugs. Call on your local Allen Distributor to supply these handy units in any of the following assortments:

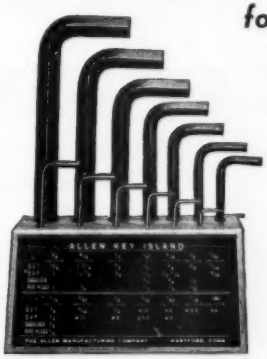
ALLEN KEY KIT NO. 603

Contains a complete set of 11 short arm *normalized* hexagonal keys which fit all screws up to and including 1 ¼ inch diameter set screws. Packed in cloth container. LIST PRICE $1.75.

ALLEN JUNIOR KEY KIT NO. 604

Seven short arm Allen Keys are included in this strong leather container. Keys fit the hex holes of sizes Nos. 8, 10, 1/4, 5/16, 3/8, 7/16 and 1/2 set screws and Nos. 4, 5, 6, 8, 10, 1/4 and 5/16 cap screws. LIST PRICE 50 cents.

for your Bench



ALLEN KEY ISLAND NO. 615

Contains 14 keys in metal stand plainly labeled to show the correct size key to use with each screw. Keys fit set screws up to and including 1 ¼"; cap screws up to 1", shoulder screws to ¾" and pipe plugs to 1". LIST PRICE $2.35.

Ask for Folder X-19

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The ARIDIFIER
Dries and Cleans Compressed Air

rungs of ½" standard pipe. The only preparation necessary is to point the side pieces on one end to keep them from slipping on the floor. The rungs are welded in at 12" intervals. Although these pipe ladders are slightly heavier than the wooden ones they replace, it makes little difference because the ladders are generally moved but short distances. These ladders sometimes become bent but it is a short job to place them on the floor and with a few blows from a sledge, the kinks and bends are straightened.

Precision Filing

The unretouched photograph shows a Multi-Purpose Tool being used for precision filing. Note that there is no vibration at the hands and because of the reciprocating action of the tool, there is no need of moving the arms, which eliminates rocking motion, a natural consequence of arm movement when filing flat surfaces. The only movement that this action picture caught is the blur of the file in the chuck of the tool, showing that the

hands and arms can be held steady while doing precision work. Using this tool, it is claimed by the H. & H. Research Co., that more accurate work can be done by an operator with little training, than may be accomplished with an ordinary file, even in the hands of a skilled mechanic.

The chief engineer of a large electric motor manufacturing plant made the

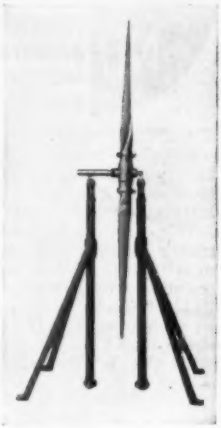
Save With Sundstrand Checking and Balancing Tools

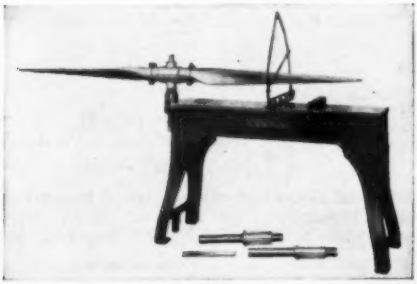
For Airport Service and Manufacturing

Sundstrand Checking and Balancing Tools illustrated are highly accurate, rugged, especially designed for airport service and airplane manufacturing. At right, Sundstrand Propeller Balancing Tool; below, Sundstrand Equipment for checking propeller pitch.

Propeller Balancing Tool, at right, has 11-foot swing; and true-running, accurately ground discs in highly sensitive ball-bearing mounting. It is excellent for all usual propeller balancing work.

Propeller Pitch Checking Equipment, below, comprises a rigid bed with accurate top, mandrel support at one end, and adjustable 0° to 60° protractor. Mandrels are available for all S.A.E. tapers and splines.





DEALERS — Investigate attractive sales opportunities offered by Sundstrand Open Line Tools, mentioned above. Write for information.

For general shop work there are other Sundstrand Balancing Tools, ranging from Super-sensitive Bench Type to 24,000 pounds capacity; and Sundstrand Precision Bench Centers in sizes up to 12" x 60".

Bulletin SBT-436 gives full details on these time-saving, economical Sundstrand Tools. Write for your copy today; and ask for the name of nearest dealer.

Sundstrand Machine Tool Co., 2535 Eleventh St., Rockford, Illinois, U. S. A.

RIGIDMILS - STUB LATHES
Tool Grinders - Drilling and Centering Machines
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"A size to fit your needs. Minimum capacity 0 to 25 inch pounds—maximum capacity 0 to 600 foot pounds. Accuracy for the laboratory—sturdiness for production."

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NO FRICTION ADJUSTMENTS MOVING PARTS FRAGILE MECHANISM

P. A. STURTEVANT CO. ADDISON QUALITY ILLINOIS

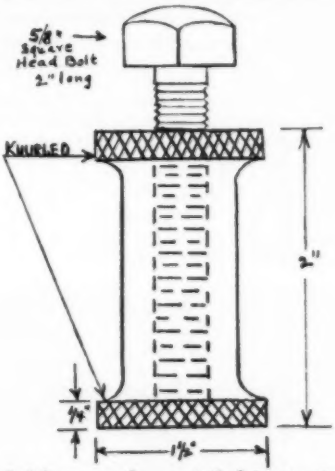
unsolicited report:—"We had a peculiar type of precision filing that would have been impossible without a Multi-Purpose Tool."

These tools are manufactured in two stroke lengths, 3/8" and 1/8", which permits the operator a selection in adapting the proper stroke to a wide latitude of work. For example, he works in a clear space with the 3/8" stroke or draw-files in a blind opening 1/4" deep with the 1/8" stroke.

Handy Screw Jack

By Theodore Oshinsly

A simple and effective Screw Jack, as shown in the illustration, can be made of round cold-roll steel and a standard 5/8" square head bolt. The Jack is an important tool wich belongs in every mechanics' kit, for use on the milling - machine, drill - press, and bench. The knurled ends insure ease of handling.



"Life-saver" Screw-driver

By Frank V. Faulhaber

Considerable time, effort, annoyance and delay are often entailed in starting unusually tight screws. Even when such screws finally are loosened, the

MACHINERY CLEANING MADE EASY

SIEBRING INDUSTRIAL STEAM CLEANER

Removes grease and grime in 1/5 the time. Ideal for cleaning machinery, motors and tools. Steam is generated in 15 minutes by fuel oil or gas. Uses a special chemical available in 3 grades. Patented safety device affords full protection. *10 Day Trial Offer — Write today.*

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CHICAGO MULTIPLE RIVET SETTERS

TODAY speed counts... speed that gets rush orders out on time... speed that keeps a plant operating at top efficiency.

A sure way to step up assembly output is to use Chicago Rivets and automatic multiple rivet setting machines. Set up to four rivets at a single machine stroke ...and set them cleanly and firmly without harming the finish. You will save money too, for Chicago PRECISION RIVETS and machines are industry's most economical combination.

Send a sketch or blueprint or, better yet, a sample assembly, for a thorough production analysis. Let us show you all the facts about multiple rivet-setting.

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TUBULAR AND SPLIT RIVETS IN ALL RIVET METALS
AUTOMATIC AND MANUAL RIVET SETTING MACHINES

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working surface is oftentimes badly marred. Such damage is not always to be countenanced. Even with the ordinary tight screws, more energy is frequently required than makes for efficient shop practice. One large plant has solved this difficulty once and for all. One of its mechanics constructed a special screw-driver, the metal shaft being fully two feet long, with a handle of mahogany 10" long. The tightest screw becomes a minor matter with this monster driver at beck. It invites frequent service, since the shop mechanics realize they can save much valuable time and otherwise wasted effort when this "life-saver" can almost instantly serve its purpose. The "big boy" has a special niche, and whenever anyone finishes using it, the screw-driver must be promptly restored, so that it can be found when wanted.

Lubricant for Drawing Cartridge Cases

Among the articles being made in connection with the Defense Program, are cases for 75 m.m. and other sizes of cartridges. These are drawn from a 70% copper alloy and it is a very exacting job in that not even the slightest scratch is allowed on the surface. The finish must be as nearly perfect as possible. This operation, which will no doubt run into millions of shells, will soon become a large production reality. In some plants, this manufacturing job, requires four operations, the third being the most difficult as it entails the greatest change in the shape and thickness of the shell.

Starting from a rather thick blank, first a cup is made and then by drawing and re-drawing, a highly finished casing is made. To lubricate these difficult draws, the parts are dipped into a solution and washed immediately after coming out of the press between operations to remove any particles that might cause a scratch in the next draw. It is, of course, very important that the lubricant used have the required properties as well as solubility in water so that it may be removed easily during the washing operation.

A new lubricant called No. 1025 Non-scratch has been developed for this purpose. It may be diluted with five times as much water in making the lubricating solution. It is claimed that various tests have shown it will produce from 100 to 150 per cent more casings between stops for honing the dies. To firms who are interested, a working sample will be furnished without cost. Address Wayne Chemical Products Co., 9446 Copeland Ave., Detroit, Mich.

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SAVE TIME—OIL—WORRY

No guesswork—bearing failures—waste—idle machine time—oil-soaked motor windings—fire and accident hazards, when you modernize with TRICO OILERS. There's a type for every application.
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Let us send you bulletins on all our Utility Tools.

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★ **As defense production gains momentum, production managers and engineers appreciate the advantages of a source where equipment for top-speed production has been tested and proved—in advance of their needs.**

Wittek *Automatic* Roll Feeds provide an improved and simplified method of punch press operation that insures rapid feeding under all conditions. Wittek Roll Feeds handle any type of coiled strip stock and are made in single roll, double roll, and compound types with straighteners, in models to feed in any of four directions.

Wittek *Adjustable* Reel Stands provide automatically expanding coil holders that center the coil and assure maximum production by eliminating looping, tangling and back lash of stock.

If your production problem involves feeding coiled stock to punch presses, it may be solved by consulting us. Your inquiry will be given immediate attention. Send for complete descriptive catalog.

WITTEK MANUFACTURING CO.
4305 W. 24TH PL., CHICAGO, ILLINOIS, U. S. A.

Guarding Press Operators

By W. A. VOLLMER

IN order to make any machine operation safer, supervisors should realize that so long as any moving parts of a machine are exposed where one can come in contact with them and get caught between two parts, such moving parts should be enclosed, if at all possible without interfering with the operation of the machine. They should also realize that most accidents happen as a result of machine and human failures. In other words, if we could depend upon each and every one to do exactly the right thing, it would not be necessary to guard operations.

Therefore, some method of automatic feeding and ejecting of the material should be used if the cost of installation and maintenance will warrant. For instance, any blanking, progressive or compound dies being operated on a punch press and being fed by any kind of automatic feed should be so constructed, if possible, as to make it unnecessary for the operator to place his hands in the die at any time. An enclosure guard can then be used so that not only the operator but anyone who might come near the machine cannot accidently come in contact with the die and thereby be injured. These types of dies can be fed with a roll feed or a hitch feed and a guard should be placed over the rolls and around the die to eliminate any potential hazard.

A roll feed has two rolls mechanically driven. The material is fed between the rolls and conveyed to the position where the work is being done. There should be a stationary piece of material placed close to the upper roll on the nip side, the lower edge of which should not produce more than a $\frac{3}{8}$" opening. The opening should be as small as possible so that fingers cannot be caught in the rolls.

A die that is performing a second, third or fourth operation and being fed by hand can be made safer by equipping it with some kind of conveying arrangement that carries the part to the point of operations. This can be done by means of a progressive hand push type feed, a mechanical pull type feed fed from a stack, a gravity chute feed, a hand push type feed, or a hand operated swinging type feed. Then all of the hazard can be eliminated by using enclosed type guards.

A progressive hand push type feed is one where several parts are consecutively placed into a conveyor. By advancing the part closest to the operator the length or diameter of the part, each part is advanced until the one closest to the point of operation is properly located.

A mechanical pull feed is one in which a stack is placed at some point in front of the operation and loaded with pieces. A mechanical device, au-

tomatically operated, carries the lower piece in the stack to the position where the operation is performed.

A gravity chute feed is an extended apron placed on the front of the die and equipped with side guides for accurately guiding the piece to the location on the die where the operation is being performed. The die should be operated on an inclined press so that the part will slide into position by its own weight.

A hand-push type feed is one in which a part is placed on a carrier at a position in front of the die and the carrier is pushed by hand to the position where the part is properly located at the point of operation. The carrier is so constructed that this operation does not place the hands in the danger zone.

A swinging type feed employs a carrier pivoted at a point to the front and to one side of the die. The part is placed in the carrier in a forward position, and then the carrier is swung by hand to locate the part at the point of operation.

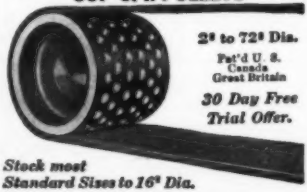
An automatic dial feed can be used for doing various operations on a punch press. If possible, the dial should be fed automatically from revolving drums connected with a conveying mechanism that carries the part to the loading position on the dial, by a stack feed over the loading position of the dial, or any other type of feed which will enable the entire dial and mechanism used in actuating the movement of the dial to be completely enclosed. A dial feed is one that is pivoted on the center of a round plate with equally spaced duplicate holding cavities or facilities for holding the parts. A cavity is loaded at a position away from the point of operation and revolved mechanically to the position where the work is being done. The dial is sometimes unloaded at the point of operation or at a position past the point of operation.

An automatic conveyor type feed has two parallel running chains with facilities for holding the parts mounted on top of the chains. The chains are driven by sprockets or other means and carry the part to the position where the operation is performed, then on to a position where the parts are removed.

In the wire products industry, the forming of many small parts involves two or more operations and hand feeding is used. These parts can be made on a four square machine with the wire fed into the machine from coils through straightening and feeding rolls. In most instances, the moving parts of this machine can be covered with guards to eliminate possibility of injury.

Screw thread rolling machines, in many cases, can be fed automatically from a hopper with a mechanism carrying the screw to the point of operation and the danger zones can be enclosed.

NO BELT SLIPS WITH VACUUM CUP C. I. PULLEYS



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Dia.	Face	Price	Dia.	Face	Price
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2 1/2"	x2 1/2"	1.45	4 1/2"	x5 1/2"	3.95
3 "	x3 1/2"	2.25	5 "	x4 1/2"	4.25
3 1/2"	x3 1/2"	2.55	6 "	x5 "	4.75

Increase your Production

We supply Fractional Dia. and Face Pulleys—From large casting stock.

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Given Vari-Speed Drive on No. 4 W & S Turret Lathe

Given Vari-Speed Motor Drive provides infinitely variable speed control to modernize old machine tools. No waiting for far-off deliveries. No heavy capital investment. Brings old tools back to life and usefulness.

Given Vari-Speed Motor Drives multiply the capacity of old tools by increasing the range of production, improving quality, saving floor space, reducing investment.

New. Nothing else like it. Thoroughly tested in practical shops. Patented. Repeat orders prove value. Scientifically designed. Precision built. Mechanically correct. Instant control to the fraction of a revolution per minute. No gear shift. No belt shift. No danger. No gaps in r.p.m. You get the EXACT speed you need while in operation. No tool marks.

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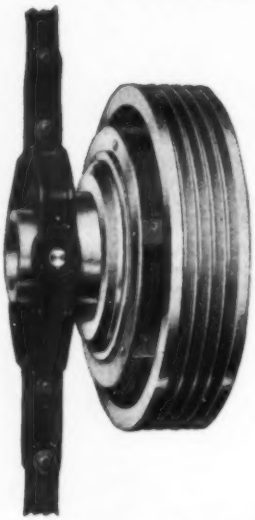
One-piece cast frame. Low center of gravity. Sealed ball bearings throughout. Dynamically balanced sheaves with ground belt faces. Large single take-off pulley. Quiet. Safe. Shockless.

D M W

might sound like some sort of a rip-snorting fraternity, but it is actually the solid premises on which the **CONWAY CLUTCH** rests its case.

Design, Materials, and Workmanship — of the smartest, strongest and most accurate—give the answer to that oft heard question:



"What makes!

CONWAY CLUTCHES

so dependable?"

Get acquainted with capable transmission performance.

Try a **CONWAY CLUTCH** on the drive.

Ask for Conway Bulletins XYZ-L, P-24, MGT, and L-29 on Disc Clutches, S-10 on Overload Release and Slip Clutches, 36A on Compression Clutches, K-32 on One-Revolution Clutches, and E-8 on Expansion Clutches.

(Patented in U. S. A. and Canada)

THE CONWAY CLUTCH COMPANY

1541 Queen City Ave., Cincinnati, Ohio

A Series Circuit Drive

By S. H. HANVILLE

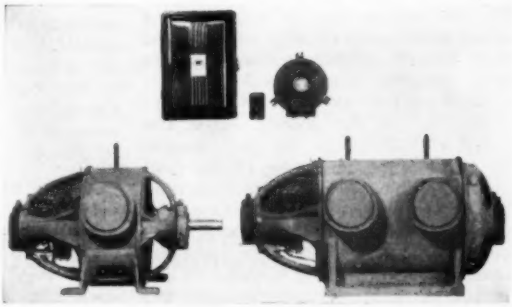
HIGH-TORQUE characteristics of a d.c. series motor are combined with flat speed characteristics of a shunt machine in a newly developed series adjustable-speed drive. Having a continuously variable speed range of 10 to 1, it is more flexible than adjustable-speed units employing wound - rotor motors.

The drive uses the variable-voltage principle, but employs a series-circuit that requires no exciter; consequently both control and wiring are simplified, and the system is more efficient than the ordinary variable-voltage system. It is suitable especially for direct connection to an a.c. power source.

The system has been applied to several different kinds of machines, such as a 10-horsepower lathe drive, a 1½ horsepower unit driving a bottlemaking machine, etc.

Reserve Torque At Any Speed

The series drive is started directly from the a.c. supply with a conventional across - the - line motor starter. Since voltage output of the self-excited generator builds up gradually under normal starting conditions, the driving motor is "cushioned" against mechanical shock. If the motor stalls, it can produce a torque equal to 6 times full-load running torque, even at minimum speed. The standard drive is suitable for operation over a 10-to-1 speed range of from 1750 to 175 r.p.m. and it is possible to extend this to a 20-to-1 range for short-time operations, such as setting up and threading. The motor will carry its rated horsepower at rated speed (usually 1750 r.p.m.) continuously without exceeding a 40° C. temperature use. The units are suitable for continuous operation at speeds of from 1750 to 175 r.p.m.



High-torque and flat speed characteristics are combined in this new series adjustable speed drive. Three machines instead of four are required, two of them mounted in the same frame. The only controls needed are a pushbutton and a rheostat.

at constant torque, without exceeding safe temperature rise.

The drive is not intended to replace conventional drives for applications such as planers, shapers, steel mills, and similar machinery requiring fast reversals, regenerative braking or accurate stopping.

Three Machines Instead of Four

Basically the newly developed series drive comprises three units: — (1) a squirrel-cage induction motor operating from an a.c. power source and mounted in the same frame with a series d.c. generator which supplies operating voltage for (2) a series motor connected to the driven machine. For speed control, there is (3) a low-resistance field rheostat. Only additional equipment required is a starter and pushbutton for the squirrel-cage rheostat. Only additional equipment required is a starter and pushbutton for the squirrel-cage motor. Where a.c. power is not available, the generator may be belted to the lineshaft or connected directly to any suitable prime mover.

No Exciter Needed

Operation of the drive is similar in principle to that of the conventional variable voltage drive except that because the exciter is eliminated, it becomes somewhat simpler. It is started simply by pushing the "start" button. This closes the starter contactor, the motor-generator set comes up to speed, and the d.c. driving motor starts. Such smooth starting provides a magnetic cushion against shock to gears or to the driven machine. With a constant load on the driving motor, the speed of that motor may be changed by varying the resistance of the field rheostat, which varies the voltage output of the series generator. Once the desired speed has been set, any tendency for load to increase or decrease causes a corresponding increase or decrease in field current because the fields of motor and generator are in series. This raises or lowers generator voltage, partially compensating for IR drop and armature reaction, thus tending to maintain a constant speed.

Dynamic Braking Without External Resistor

If the application requires it, dynamic braking and inching can be incorporated in the circuit without using an external braking resistor. Braking is accomplished by a so-called "self-energizing braking field" which is no more than a separate series field wound on the same shell as the series field coil of the motor. Besides making external braking resistors unnecessary, the resistance of the field limits the braking current to a safe value. In operation, when the braking contactor is closed, the motor is disconnected from the generator and armature of the series motor to produce a magnetic effect opposite to that normally produced by the motor's series field. This brings the motor to a quick, decisive stop. Only extra equipment necessary for dynamic braking is an auxiliary braking contactor mounted near the a.c. motor starter, and electrically interlocked with it. If desired, braking torque may be varied by an external variable resistance.

Inching Operation, If Needed

When dynamic braking is employed, the addition of a momentary-contact pushbutton to the regular start-stop pushbutton station provides an inching control. The inching button is electrically interlocked with the field rheostat so that the drive will inch only when the rheostat is set for slow speed. This prevents strain on driving motor and the driven machine.

Ability to inch becomes especially valuable when the drive is applied to machines where strip material must be fed through slowly at first, after which speed may be increased for normal operation.

We Are Grateful

For the many friends, old and new, who visited us at the A. S. T. E. show, each with a word of praise or congratulation on our Index High Speed Vertical Mill.

To you who were not there and know nothing of our machine, it would have been a revelation to have heard the wonderful words of praise; such as

"We like your machine very much. We have two in our plant and two more on order."

"We do much more on your machine than we ever dreamed of."

"We do nothing but jig boring with it."

"You have taught us something about end milling."

"When can you ship us another machine?"

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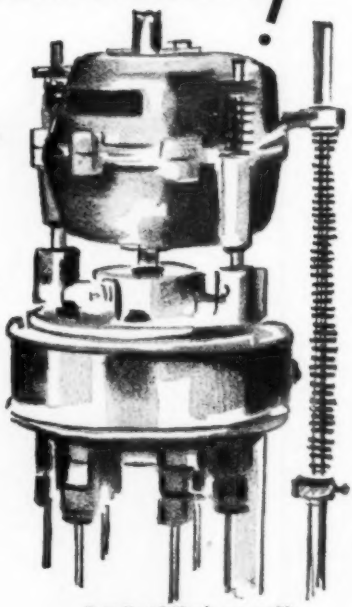
YOU CANT BEAT THE FAMOUS Ettco-Emrick System FOR MULTIPLE TAPPING AND DRILLING!

Just read this brief outline of the Ettco-Emrick System of **heads "tailored to fit" from STOCK parts** and see if you don't agree it's the simplest, quickest and most economical way to meet your multiple tapping and drilling requirements . . .

The basic part of every Ettco-Emrick tapping head is this **standard** friction clutch and face plate driving unit equipped with a taper shank to fit the drill press spindle. The feature of a single central clutch—renewable if need be in a few minutes—is an important advantage in multiple tapping. To change from tapping to drilling this driving unit is simply replaced by a standard face plate and taper shank unit for direct driving.

A big feature of the system is this gear case assembly made entirely of **stock** parts arranged to fit specific tapping or drilling requirements. Each case is a complete unit, and can be interchangeably bolted to the face plate of either the tapping or the drilling drive unit. No need to point out how quick and easy this makes it to change from one tapping or drilling set-up to another.

All **YOU** need do is send us a drawing giving center distances and essential tap and drill data—and if practical, a sample part. We do the rest.



Ettco-Emrick Heads are readily applied to any drill press.

GET ALL DETAILS IN BULLETIN 3

It tells you why this system, unequalled for fast, low-cost tapping and drilling production, also assures consistent accuracy and maximum tap and drill protection. Write for Bulletin No. 3 today.

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DRILL CHUCKS • TAP HOLDING CHUCKS
TAPPING ATTACHMENTS • TAPPING MACHINES
MULTIPLE SPINDLE TAPPING AND DRILLING HEADS
Unexcelled for Design, Materials and Workmanship

Modern Handling Equipment

By GEORGE A. FAIRMAN

THE machine shop of the Heald Machine Co., is very completely furnished with mechanical handling equipment, both in the manufacturing and assembling departments. The shop is, of course provided with modern machine tools and is arranged in bays on one floor at ground level Some of the work is small and light in weight but much of it is heavy and calls for mechanical handling.

A large part, if not the largest, of the handling machinery is of the overhead type, consisting of traveling cranes of short span, and hoists for the lighter work. Most of the hoists are electrically operated.

Capacity of the cranes varies, depending on the requirements of each location. For instance throughout the machining area, one to two ton cranes are used. On the scraping floor where heavy castings and bases are handled, 3-ton cranes have been installed, as is the case in the fixture and run-off department. Where units are assembled to machines, 1-ton cranes are sufficient, and in the main aisle, up and down which finished machine tools are moved, a capacity of 10 tons is required. In the shipping room where the boxed, or crated, finished products are placed on trucks, the travelling crane has a capacity of 13 tons.

Every bay throughout the shop is provided with traveling cranes, the number in use depending on the department served. Altogether some 200,000 sq. ft. of floor space has 50-odd cranes, all Shepard.

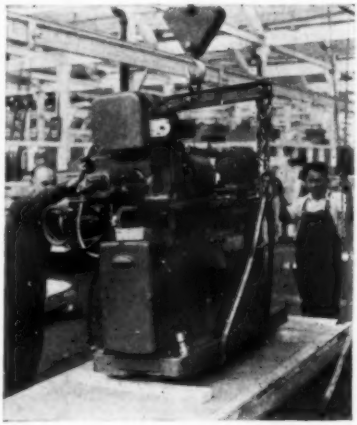
In addition to the overhead cranes and hoists, lift trucks and skid platforms are used extensively for movement of parts and even whole machines from one part of the plant to another. This is all Lewis-Shepard equipment.

Heald conveyor line-machine assembly. Several traveling cranes are used regularly in this bay.

Bores are super-finished, straight and round within .0001. Domes are black, rust proof and knurled. Lock Screws are made from nickle steel and cadmium plated. All standard sizes available. Write today for complete facts and prices.

UNIVERSAL
Engineering Company
Frankenmuth, Mich.

It is an interesting distinction from the use of cranes, which are mainly employed for lifting rather than for transportation.



Lowering assembled machine on shipping skid, preparatory to final painting.

On The I. H. Assembly Line

Progressive assembly, as it is known in industry today, probably had its beginning in the now established fact that production can be increased with less manual effort, if material and partial assemblies are brought together at the proper time at predetermined points, rather than having operators move about from one assembly station to another. Although the automobile is commonly cited as an example of the benefits of progressive assembly, similar methods and practices, are serving countless other applications in light and heavy industries.

An interesting application of progressive assembly line practice is to be seen at the International Harvester Company's Indianapolis Truck Engine Works, producing engines for the company's line of International motor trucks. Here the assembly line for the L-head type engine, used in the light-

TEAM WORK

SUTTON Feed Fingers and Sutton DIAMOND-GRIP Collets work together to increase screw machine output and reduce spoilage. Catalog No. 14 lists all styles and sizes . . . ***Ask for a copy.***

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This sturdy 36"x48" Milwaukee Surface Plate is of semi-steel construction, accurately machined, provided with cross ribs every 10½" for rigidity, securely mounted on cast legs which are machined and provided with SAE adjusting screws for perfect alignment. Height from floor to top of plate 30". Shipping weight 1200 lbs.

We also make larger and smaller plates either with planed or scraped surfaces, whichever is desired.

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GREATEST TIME-SAVER IN DEFENSE WORK

● The Sensational savings in time effected in metal working plants equipped with one or more DoAlls are easy to figure, but there are other savings, too intrinsic in value to measure —savings of energy, temper, and mental fag, when rush jobs at last move through in one-half to one-quarter the former time.

Model V-36 with 36" throat handles large and odd-shaped parts at Northwest Airlines, St. Paul.

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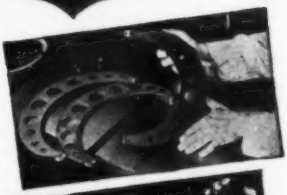
DO IT WITH A DoAll

Speed up production — cut corners—turn out better work. Wherever metal is shaped, cut and used, the DoAll is an equipment "must". Takes the place of shaping, milling and lathe work on hundreds of jobs.

Let us send a factory trained man to your plant with a DoAll to show you what this remarkable machine tool can do for you.



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These special frames sawed in 45 minutes at Northwest Air-Lines.

PROPELLER WRENCH
Made at Northwest Airlines. Inside cut, 15 minutes. Outside cut, 30 minutes.

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On DoAll Contour Machines

Because our manufacturing facilities were increased 400% early in 1940, before the defense program started.

Because we use arc welded construction for greater speed, and have developed a process of attaching pads that have machined surfaces, which eliminates handling and machining heavy frame work.

Every 40 minutes we take a DoAll off our 1,000-foot assembly line.

Like Detroit's auto plants —DoAlls are built as fast as needed—giving you higher value.

Now recognized as the indispensable machine tool, this new shape-cutting process has revolutionized machine shop practice throughout the world.

Again the progressiveness and foresight of the DoAll Organization is demonstrated in making immediate shipment to aid American industry in meeting today's demand for greater and faster production.

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Manufacturers of Band Saws and Band Files for DoAll Contour Machines

duty trucks, has a straight line run of 490 feet. The first 250 feet consists of a 14" roller conveyor with pallets. At this point, the engines are transferred to a power-driven conveyor. At 5-ft. intervals are steel pallets onto which the partially assembled engines are placed. These pallets allow the engines to be adjusted in any one of eight horizontal positions as they move along, the conveyor being equipped with a variable speed control, which may be set to maintain the production schedule desired.

1. Valve-in-head Engines, for use in Heavy-duty Internationals, passing, along Assembly Line.

Running parallel to, and within 20 feet of this light engine assembly line, is an overhead trolley conveyor with assembly carriers spaced every 10 ft.—the assembly line for valve-in-the-head engines, used in the heavy-duty Internationals. The cradle-type carriers on this line, like the pallets on the other conveyor, are so constructed that engines may be brought to any one of the positions in a vertical plane to facilitate assembly.

Suspended from a trolley and running between the entire length of the two

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CONTINUOUS A. C. ARC WELDERS

Need a welding machine in a hurry? Then you want the A.C. Arc welder used by leading industries . . . fast, amazingly easy to operate, contains no moving parts. You'll like its low cost of operation, the strong uniform welds it produces, and its price. Guaranteed 12 months. Send for folder and price list today.

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Steps:	24
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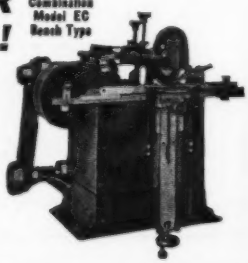
Sharpens Dull Saws BETTER THAN NEW—*and saves 80%!*

Combination Model EC Bench Type



Sounds incredible—but that's what the WARDWELL SAV-A-SAW is doing for other concerns. Doesn't make any difference whether you're using hack, band, or circular saws either—they're all alike to the SAV-A-SAW. Completely automatic—takes saws with teeth as fine as 32 to the inch at a 75 per min. speed. Here is ECONOMY in capital letters—savings on just 2 gross will pay back the machine cost. And you have edges BETTER THAN NEW!

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4 JAW INDEPENDENT L-W LATHE CHUCKS

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10"	Size	$32.00
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Also Mfr's. of
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3 STEPS to SAVING TIME and MONEY

The order of today is greater production in less time — without lost motion. Let's all get going!

1 HANDEE
Tool of 1001 uses

The 12-ounce portable "power house" that repairs hard-to-get at parts on machines without removing the part. Smooths off rough spots on dies and tools, cleans delicate mechanisms — grinds, drills, polishes, cuts, routs, carves, sands, saws, sharpens; engraves, etc. Uses 300 accessories. Plugs in any AC or DC socket. Speed, 25,000 r. p. m. $18.50 postpaid with 7 Accessories.

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Constructed for heavy duty service and does it give smooth performance! Enough steady, vibrationless power to drive a 2½" diam. wheel with precision accuracy. Speed 17,000 r.p.m. Wt. 3 lbs. In wood case with 3 Chicago mounted wheels, drum sander and bands, 2 collets, wrenches, dressing stones, $35.00.

In foundries, machine shops, tool and die plants —wherever metal is used or shaped—these three portables are necessary because they are of such tremendous assistance: (a) Handee Tool of 1001 uses, (b) Hi-Power Grinder, (c) a good stock of Chicago Mounted Wheels.

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Send for either DeLuxe model HANDEE or the Hi-Power and try it for 10 days in your own plant.

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Aeronautical Products, Inc. "We have used Rigid Live Centers exclusively for years and have never seen one of them overloaded. While the same work from a dead center would have melted it."

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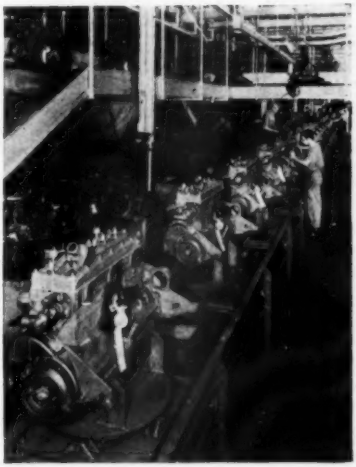
assembly lines, are 40 power-driven wrenches—both electric and air—used in running down nuts, cap screws, studs, etc. A three-day supply of stock is kept along the assembly lines, much of it in tote pans which slide into specially built tote-pan racks.

Sub-assembly lines converge on these main assembly lines at points where the parts are to be used. Cylinder blocks, for instance, are inspected on a roller conveyor extending from the cylinder block washing machine and proceeding down this conveyor to where the engine assembly operations start. A sub-assembly is made of the crankshaft and fly-wheel, and the clutch face on the fly-wheel is checked for run-out. When ready, this sub-assembly is lowered into the engine by means of a hoist suspended from an overhead tramrail. Other sub-assemblies are handled in a similar manner, each being placed in the final engine assembly at the right point. The last operation on each assembly line is the placing of a special steel hook on each engine for transfer-



2. L-head Engines, used in the Light-duty Trucks, are Assembled on the Continuously moving Pallet-type Power Conveyor

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DIAMOND POINTED EMERY WHEEL DRESSERS

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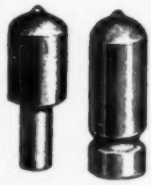
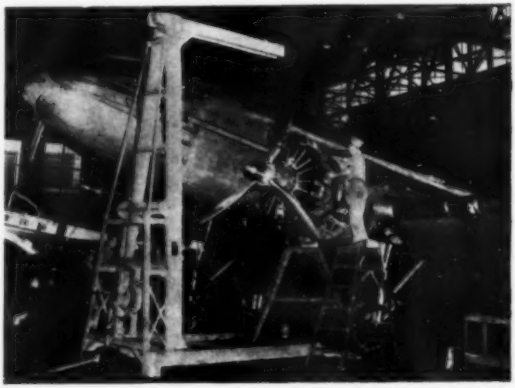


E. KARELSEN, INC. *Established 1852* 56 W. 45th St., New York, N. Y. Tel. VAN. 6-5688

ring it to the block test conveyor accommodating both lines.

In the block test room, dynamometer stands are provided with water, oil, gas, and electrical connections so that engines can be run either idle or under load. The L-head engines are tested at two different speeds, 800 and 1500 r.p.m. The valve-in- head engines are also tested at two speeds,—the first hour at 800 r.p.m. and the last half hour at 1750 r.p.m. under load. For testing purposes, three sound proof test rooms are located at each end of the block test department. Each is served by a tramrail crane to transfer the engines between the test stands, and a trolley conveyor which carries them to a water-wash type spray booth for painting. This paint coat dries thoroughly as the engines travel along on the conveyor toward the loading dock where they are placed in freight cars or on highway motor trucks for shipment—the L-head engines to the company's Springfield, Ohio, plant for assembly in the light-duty trucks, while the valve-in-head type engines are sent to Fort Wayne, Ind., where the heavy-duty Internationals are built.

Servicing Aero Engines



Here is a standard Lewis-Shepard portable crane at LaGuardia Field, N. Y., where it is used during overhaul of airplane engines on American Airways Liners, for lifting or lowering engines into position. It has a special hook lowering device on the crank stud for speed in lowering the hook. These cranes are also in use at many air schools and colleges

Not only the airplane industry but many others in the defense program or allied to it can make use of such cranes to speed up production, maintenance or repair work.

Interchangeable winches permit conversion of hand models to power operation. Cranes are built in capacities, lifting heights, boomlengths, etc. to fit requirements.

Because the crane is not fixed in direction or position, it becomes in ef-

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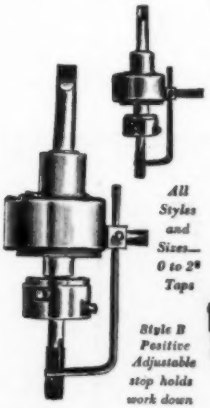
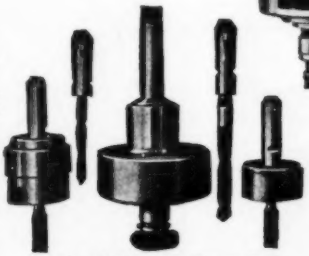
Our High Speed Tappers are Super-Sensitive for Small Tapping

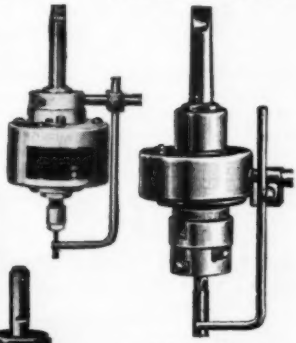


All Styles and Sizes— 0 to 2" Taps

Style B Positive Adjustable stop holds work down

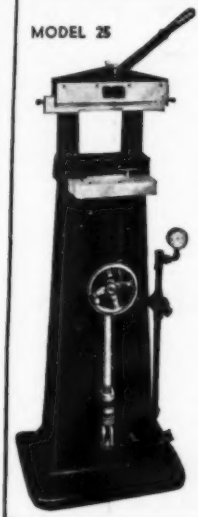


Style D-E, Quick Change Tools



Style C Graduated Adjustable Safety Friction

MODEL 25



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Positive, Permanent marking on your products assist prospects to order. Makes it easier to buy—new, repeats and repairs. Gives you a definite record of pertinent data on each part produced.

The Pneumatic marking machine illustrated is our HI-DUTY model 25 general purpose tool for short runs or production work. It operates from your shop air line and is one of numerous models built to produce neat, permanent markings quickly on metal fabrications.

We will be happy to make specific recommendations upon receipt of samples or prints of parts to be marked, showing approximate lettering, its location on the part, with required hourly production.

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fect a flexible overhead hoist which can be used anywhere at any time.

A hinged frame allows passage through doorways; with telescopic frame for work under and around overhead obstructions; or with revolving base. They can also be made to combine all three features.

Steel Blocks Help Assembly

Ability to work freely on all sides of a motor is particularly important in assembly operations. It cannot be done when the motor is placed on the ordinary workbench along a wall. Nor is it something which can be solved to best advantage simply by locating sections of workbench or tables around the assembly floor. With motors of many different sizes going through a department, it would be necessary to have a cumbersome variety of sizes of benches or tables. A bench large enough for a fair-sized motor would be much too long for a small job.

When, as in the plant of Reliance Electric & Engineering Co., many of the motors being built are far larger and heavier than can be handled without the aid of chain lifts or cranes, the time that can be wasted in shifting them around can add up to a very considerable amount. However carefully a motor may be picked up and moved about, there are always two hazards,

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MILLING MACHINES
Make Fast Work of Small Jobs

Motor Driven

Timken roller or ball bearings to spindle

Write today for circulars.

Burke Machine Tool Co.
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"PENCILPOINT" DIAMONDS
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A hard natural point (not cut). A long, slender diamond to be used up without resetting. Toolmakers prefer them. $1.50 each; $1.20 each for 10; discounts in quantities.

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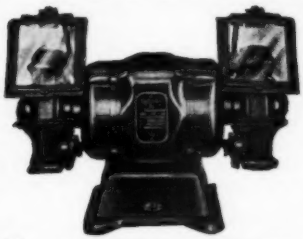

THIS GRINDER *Guaranteed 2 Years* AGAINST BURN-OUT

BALDOR GRINDER No. 612 has Capacitor Type 1/3 HP Motor guaranteed 2 years against burn-out. 3440 r.p.m., 110 volt, 60 cy., single phase. 6"x3/4" wheels; enclosed guards; adjustable eye shields; tool rests adjustable vertically and horizontally. Net weight 46 lbs. **$33.50**

The COMPLETE LINE of BALDOR Grinders (bench and pedestal types) described in BULLETIN 89. Ask for it.

BALDOR ELEC. CO.
4368 Duncan Ave., ST. LOUIS, MO.

BALDOR BALL BEARING GRINDERS

the first to the operator and the second to the motor itself.

At Reliance the handling problem has been simplied by the introduction of strong, compact, easily handled steel blocks on which motors can be "spotted" with plenty of room on all sides for assembly work to be carried on to completion without further shifting of the machines.

The very largest motors, those of several hundred horsepower, are high enough to be assembled right on the floor without supports. Smaller motors, running in weight from a few hundred pounds to as much as 10 or 12 thousand pounds, are placed atop one or even two rows of steel blocks, depending on which working level is found most handy. Generally speaking, the medium-sized motors are assembled on a single height of blocks and the small motors on the double height arrangement.

The steel blocks are 12" square, made from 12x12" I-beams which have been sawed in 12" lengths. Light angles are welded in the four corners of each section of I-beam to give it uniform rigidity and to facilitate its handling. The blocks can be lifted and arranged safely and easily by hand.

Easier Single Stroke Lift

Bringing the lever and fulcrum principle up-to-date and applying it to the handling of 3,500 lb. loads for all industry, Yale & Towne Engineers announce a new "Red Streak" Hand Lift Truck with simplified lift.

Re-designed, the lift mechanism has fewer moving parts and incorporates safety features to prevent tripping and "Flying handle". Details of this compound (articulating) lift mechanism that are said to change the lifting ratio, flatten the lift curve and require less lifting effort, are illustrated.

The hand-grip is larger and is satin-smooth and chrome-finished. The hand grip, tubular handle shaft, and lower handle casting, are welded into a single

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unit to keep parts from working loose.

The balancing mechanism which keeps handle in an upright position prevents tripping and relieves operator of handle weight, is enclosed in the tubular handle shaft to protect it from outside shock and assure long life. The "Red Streak" now uses a shorter handle stroke and consequently requires less bending effort by the operator. To prevent "cornering" in cramped quarters, it features 90° lift and full 180° steer.

All wheels are steel with a machined-smooth face. Wheels are mounted on ball bearings which are sealed against dirt intrusion by built-in hardened steel washers.

The front head and steering column are solid steel castings, assembled on a fifth wheel (turntable) with a hardened and ground thrust washer.

Details of lift mechanism:

1. Ready to lift—heavy-duty steel lift hook positively in engagement—held securely by spring A. Cannot be accidentally disengaged.
2. As handle descends, a change of leverage takes place. Lifting force is shifted from B to D via action of intermediate link C. This is the compound lift that makes it as easy to get the lift started as to keep it going.

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BEST BY TEST

Flexible Shaft GRINDER

Model F 2
½ H. P.

IMMEDIATE DELIVERY

- Shaft overall 5'-6"
- Overall height 34"
- Weight 72 lbs.
- Choice of either 1725 or 3400 RPM
- Voltage, 110—220—60 cycle.
- Finished in gray enamel.

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Insert WALTON Tap Extractor and back out broken piece. No annealing—no drilling.

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Tap Extractor and Tap Wrench are only tools needed.

Safely
Threads are not damaged. Not necessary to tap oversize after broken tap is removed.

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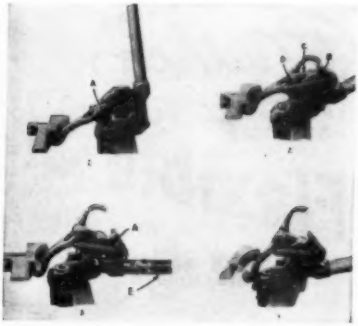
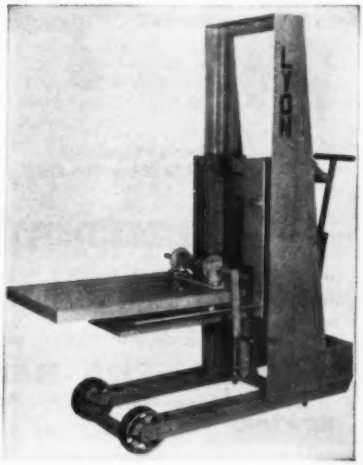


3. Lift accomplished—load is positively locked in place. Secondary safety spring E (in handle) is forcing handle up to dis-engagement position where handle will be free of the load.
4. Secondary spring has raised handle—hook automatically drops out of engagement, preventing "flying handle".

Handling Heavy Dies

The Lyon Iron Works, 696 Madison St., Greene, N. Y., have developed a unique design of Hydraulic Die Handling Truck.



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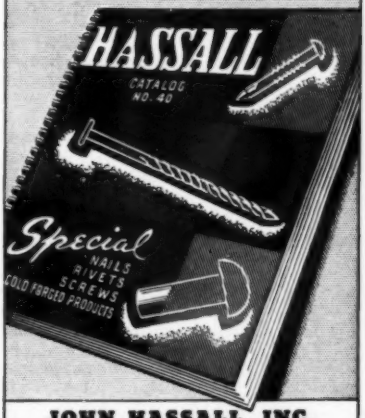

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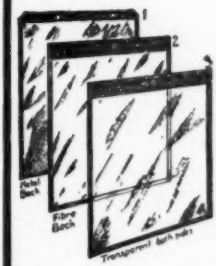

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DRILLMASTER RADIAL DRILL

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Send TODAY for bulletin giving full details.

Wm. C. Johnson & Sons Machinery Company
St. Louis, Missouri

It features a revolving table with stops at each 90°. When in its standard position, the table extends about one foot beyond the edge of the wheels so that the table may be put close to the press when taking out or putting dies into the press. It is particularly useful where base of the press extends beyond the bed. This arrangement is also very convenient when moving dies on and off shelves where the lower shelves may have dies stored that protrude beyond edges and would otherwise interfere.

The table is equipped with a winch for pulling dies on and off of the table.

The truck shown is of 1,000 lbs. capacity, has a table 24x36—31″ to winch, lowered height of 12″, elevated height 51″, elevation 39″, with a two speed hydraulic hand pump. May be furnished for other capacities and specifications and with a motor driven pump instead of the two speed hydraulic hand pump.

Gravity Wheel Conveyors

To speed up production on line work, and also for loading and unloading cases, cartons, boxes and, in fact, anything with relatively smooth bottoms, a light weight but sturdily built conveyor has been developed by the Metzgar Company.

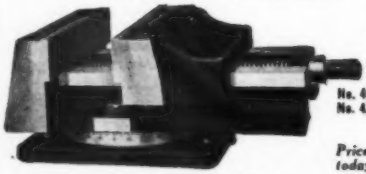
Adaptable for conveying of loads weighing less than 500 pounds, this gravity wheel conveyor is made in 5 and 10 foot sections and curves. Features include light weight, combined with sturdy construction enabling it to carry loads up to 500 pounds; oilless and dust-proof pressed steel wheels; ease in assembling; and elimination of rough edges on channels and other members.

Unit weighs only 6.7 pounds per foot, making it possible for one or two men to set up a line quickly. Also available is a power belt conveyor, coupled with this for permanent installations, which is claimed to be more active and less flexible than older types and to require little maintenance cost.

Material Handling Bulletin

A new bulletin briefly describes the line of Material Handling Equipment, most of which is Hydraulic, manufactured by Lyon Iron Works, 649 Madison St., Greene, N. Y.

SUPERIOR QUALITY AND WORKMANSHIP IN PLUNKET VISES



SQUARE BASE SHAPER VISE

The Shaper Vise has graduated swivel base and tongue in center to fit slot in table, and has holes for bolting down. In ordering this vise give size of slots in Shaper Table, also distance from center to center of slots.

No. 48, 10″ jaws, 2¼″ deep, opens 8½″. Weight 125 lbs. $52.00
No. 4, 6″ jaws, 1½″ deep, opens 5″. Weight 45 lbs. $38.00

Our complete line includes Vises for Drill Presses, Milling Machines, Shapers and Grinders.

Prices are net, f. o. b. Chicago. Write for illustrated folder today. Dealers inquiries solicited.

J. E. Plunket Machine Co, 1123 W. Lake St. Chicago, Illinois.

Manganese

Recent developments in the war have intensified the nation's problem of obtaining adequate supplies of essential manganese for steel production, Langbourne M. Williams, Jr., president of Cuban-American Manganese Corp., declared recently in "Chemical Industries" magazine.

"Shipments from Russia have for years been our leading source of ferro-grade manganese ore. These have been brought to an end by the swift turns of the war," Mr. Williams said.

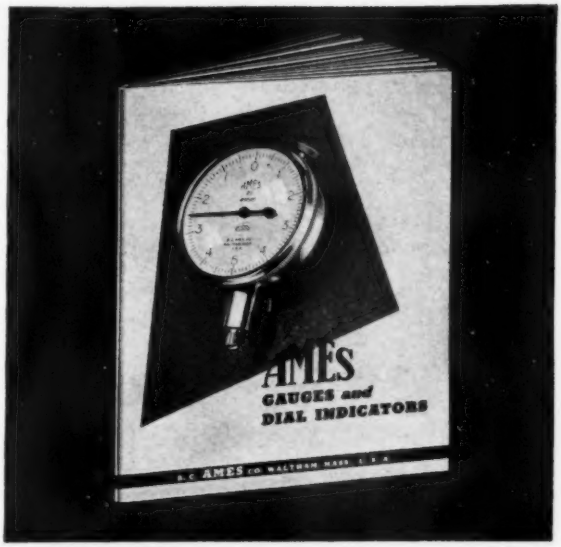
"Shipping rates from other sources — India, the Gold Coast, South Africa, and Brazil —have increased strikingly, in some instances as much as 500% since the war began.

"In fact, the increasing difficulty of getting ships, to say nothing of the potential dangers to shipping that the war holds, has made the nation's manganese problem one of active concern."

An estimated 14 pounds of metallic manganese are used in the production of every ton of steel, Mr. Williams pointed out, and no substitute for manganese has ever been commercially employed.

"Under normal conditions, we depend upon foreign sources to supply nearly all of our ferro-grade ore consumption requirements," he continued. "Although there are widespread deposits of low grade ores within our boundaries, these domestic deposits have generally produced less than a tenth of our ferro-grade ore requirements."

Mr. Williams reviewed the efforts being made by government and defense officials and by private organizations to guard against a repetition of the critical manganese shortage that resulted during World War I and proposed lowering of specifications for ore now being purchased to stimulate domestic production and encouragement of production in Cuba.



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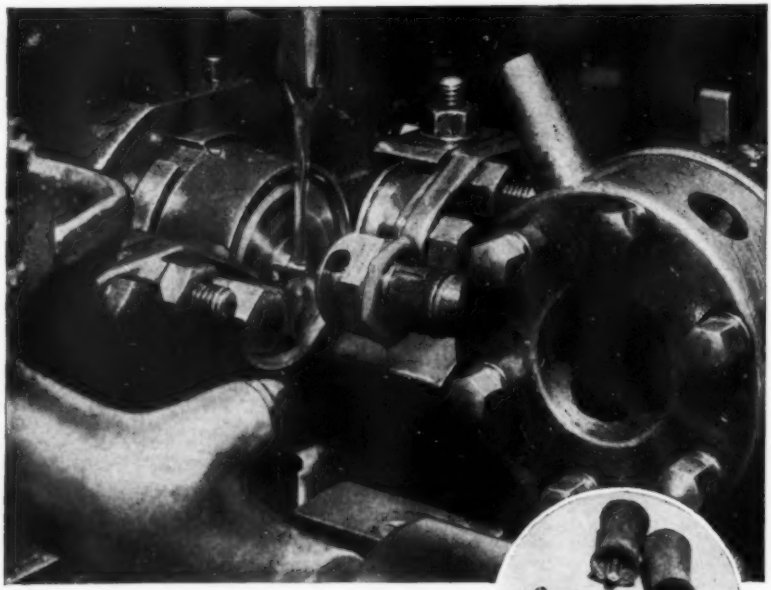
of this new Catalog, just off the press, which shows a complete new line of Ames Gauges and Dial Indicators.

B. C. AMES CO., Waltham, Mass., U. S. A.



"Have Used 'Acorns' for 20 YEARS!"

So said a big manufacturer when he gave us these pictures of dental polisher parts. We figure 20 years' loyalty to "Acorn" Dies is pretty significant. It is recognition of the leadership established by "Acorn" Dies in the field of fast accurate threading on automatic machinery. This particular job is cutting 1-72 M. S. threads and by using "Acorn" Dies at 2420 R. P. M., he turns out 900 per hour.

Working with this manufacturer for many years has enabled us to meet his changing requirements with a minimum of disruption to his production schedules.

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What's New in the Industry

Elgin No. 59 Bench Milling Machine

A STURDY new precision bench milling machine with many advanced features is announced by Elgin Tool Works, Chicago.

Specifications reveal that it is of 1" collet capacity, both in spindle and index head. Table is 4" wide x 18" long. Longitudinal travel is 12"; transverse travel, 6" and vertical travel, 7". Center distance, headstock and tailstock, is 11".

Super Perfex preloaded ball bearings are used front and rear. Spindle is of 52100 ball bearing steel, hardened and ground internally and externally.

Eight spindle speeds are provided with a 2-speed motor, in a range of from 130 to 2500 r.p.m. Drive is by V-belt and belts are replaceable without removing spindle. Automatic spindle brake is furnished.

Adjustable dials are graduated in thousandths

Locks are provided for table, knee and saddle.

Bearing surfaces are extra large and accurately scraped. All slides are fully gibbed.

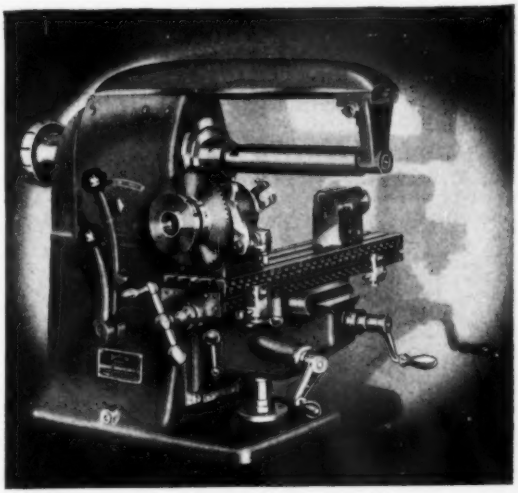
Vertical screw is fully encased and a ball bearing thrust is provided.

All adjustments can be made without removal of any parts.

Can be furnished with or without overarm.

Index plate and latch may be removed and replaced with a 40:1 turn dividing head attachment which can be set to cut over a range of from 2 to 360 divisions. Index head is No. 5, and of 1" collet capacity; 3" center distance; 6" diameter index plates. Index plate or worm wheels lock in any position on spindle and spindle may be locked in any position.

Swivel vise is 8" long, 2¼" high and base diameter is 5¼". Jaws open to 2-⅛" and are ⅞" deep. Jaws are hardened and ground. Vise swivels 360°.



Heavy Duty Jack

"Bee Line" announces a new heavy-duty 50-ton Hydraulic Jack with several outstanding features.

Total weight is 74 pounds. A spe-

Rely on these Husky
STOW
Flexible Shaft Machines

for
Grinding
Sanding
Wire Brushing
Drilling
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When you are giving a machine the tough jobs to do—you need plenty of power, PLUS a shaft that stands hour after hour of continuous production without let-up. Stow gives you this combination of reliability plus power—backed up by 66 years' experience as the originators of the flexible shaft.

HEAVY-DUTY MODEL

Stow offers a big selection of units and the broadest line of attachments on the market—assures you the ***right*** machine for either heavy-duty or light work. Stow's proven quality—its true precision—its exceptional ruggedness—make your investment earn money year after year!

Write for helpful Stow Catalog ***NOW!***

STOW MANUFACTURING CO., INC.
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Established 1875
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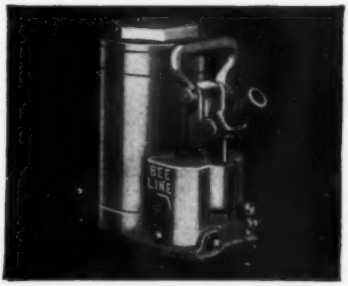
cial high strength alloy is said to be used throughout permitting a 50 per cent overload. Automatic takeups are

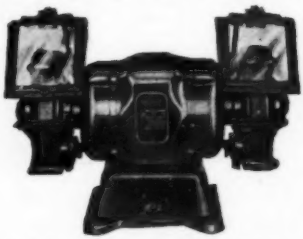


asserted to require less oil pressure per ton of lifting capacity. Simple construction—fewer parts than required in similar heavy duty jacks. Large oil ports and passages assure quick return of ram and no air-bound troubles.

Descriptive literature may be obtained by writing the Bee-Line Co., Box 569, Davenport, Iowa.

Baldor Offers New Grinder

A new 6" Baldor grinder is designated as their No. 612. It is rated 1/3 h.p. and is furnished with 6" diameter ¾" wide wheels. It also features:—



Fully - enclosed guards; Tool rests which are adjustable horizontally and vertically and may be tilted for angle grinding; Adjustable shatter-proof eye shields; Powered with a Capacitor Type Motor, it is guaranteed against burn out for two years. Detailed information is given in Bulletin No. 89.

Jobs

"How You Can Get a Better Job" is the title of a book recently published by the American Technical Society, Chicago.

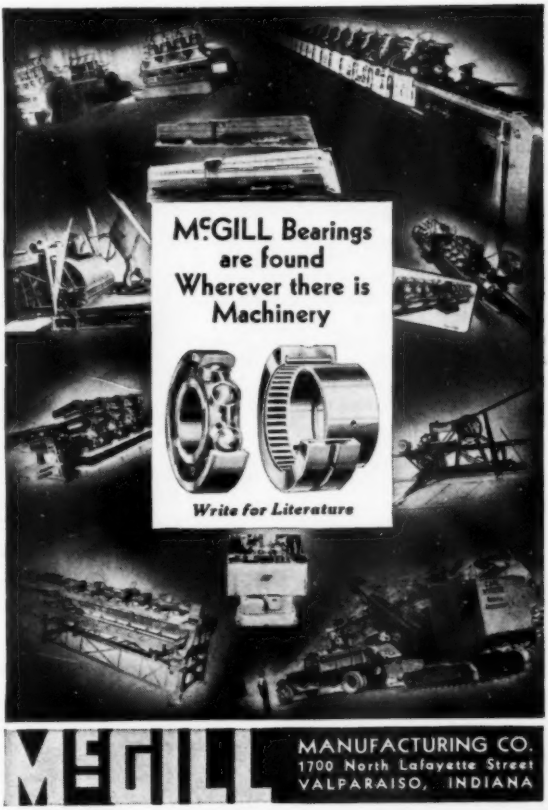
Written by two experienced educators, W. K. Lasher and E. A. Richards, it is devoted entirely to the ways in which an individual can increase his value to his employer, regardless of what his occupation may be. This should have a broad appeal at a time like the present, when there is such a crying need for men "at the top."

"Shop Talk" is the title of the second chapter. It includes a number of helpful hints on how to make oneself both well liked and valuable in the shop. The chapter "Office Talk" contains many suggestions which are of as much value to shop men as to office workers. Part I also contains chapters on contact with the public, telephone manners, etc.

The second part is devoted to the interesting and highly important subject of self-management. The proper use of time at work, leisure time, and personal habits, are discussed concretely and in detail. Also treated is the significant question of ambition and its legitimate function in one's plans.

Part III is titled "Selling Yourself." Forty pages survey the all-important subject of how to find a job—the letter campaign, interviews, changing jobs, etc. This chapter should prove of value to men employed as well as to those looking for a job.

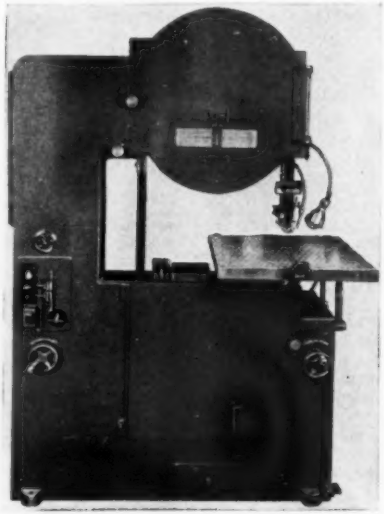
Further chapters cover such elementary yet vital subjects as getting adjusted on a new job, how to ask for a promotion or salary increase, and how to check up on oneself. Under "Checking Up" are included seven basic questions that the individual should ask himself. If answered truthfully they indicate whether he is on the right track.



Defense Demands Unusual Machines

A new Tannewitz Di-Saw with a 30″ throat—(distance between the column and the saw blade) has been developed recently for some of the defense industries. Though this exceeds by six inches the standard Di-Saw, it is the smallest of several machines of this type available to meet special requirements. Saws having 36″ to 48″ throat capacity and even larger sizes can be supplied. All are built along the lines of the standard No. 24M model, which has proven so versatile and so useful for cutting shoes, dies, templets, filing, polishing and many other operations.

Complete information concerning machines of this type may be had by addressing: The Tannewitz Works, Grand Rapids, Mich.



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FLEXIBLE SHAFT TOOLS
INDISPENSABLE in TOOL, DIE, MOLD and PATTERN SHOPS—
Yet INEXPENSIVE ENOUGH for even the SMALLEST SHOPS!

Use the **Foredom Flexible Shaft Tools** for removing burrs, corrosion and high spots, grinding, finishing, and touching up dies, cutters, tools, etc.; sharpening, identification marking, milling, slotting, cutting oil grooves, under-cutting, routing and countless other tasks.

Bench and suspension models available, some with pencil-size handpieces. Model illustrated is No. 340, priced at $39.50—with either foot or hand-operated speed control.

SEND FOR COMPLETE CATALOG H

Builders of Quality Tools Since 1922
FOREDOM ELECTRIC COMPANY, Dept. 216
27 Park Place, New York, N. Y.

ARMGLO
Manufacturers of Resistance Welders—Foot, Motor, Air and Hydraulic operated.
•
Standard and for specific applications with and without electric timing control.
•
Bench type filing and sawing machines and abrasive band finishing machines.
•
ARMGLO COMPANY
Milwaukee, Wisconsin

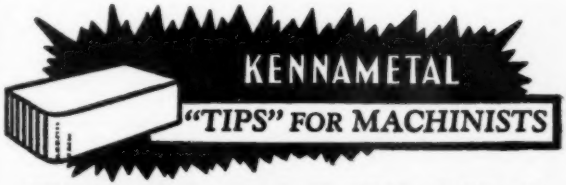
Idle Shops

A recent survey in a typical industrial state— Illinois—reveals that much remains to be done before all available manufacturing capacity is being utilized as a part of the national defense effort.

The Illinois Labor Department is conducting a survey of the 2250 plants in that state employing from 6 to 500 workers. Returns from approximately half of these plants show that 42% have no defense work of any kind. Many such firms are using their equipment less than three—fourths of one full shift.

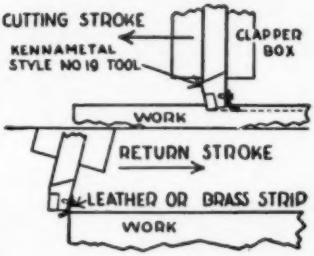
Director of Labor Martin P. Durkin says that at present there is a sufficent labor supply to man plants and equipment producing defense materials. This has been shown by Illinois State Employment Service records and also by the plant capacity survey itself. Many employers stated that they were not working their employees full time. The limited observations made by Director Durkin are based on studies of 68 plants employing from 6 to 500 workers and engaged in production of iron and steel and their products, electrical machinery, and non - electrical machinery. The greatest unused plant capacity was found in plants employing from 6 to 40 workers. In that group, 166 out of 314 plants had no defense work of any kind. That is, 48% of the smaller establishments of the State have had no opportunity to contribute to building up national defense.

"Practically all of the small firms indicate that with moderate changes in their equipment those who are not doing defense work would be able to do a great deal and those who already have some would be able to handle considerably more." Director Durkin said.



HOW TO AVOID BUMPING TOOL EDGE ON RETURN STROKE IN PLANING OPERATIONS

If your planer is not equipped with a head which automatically lifts the tool on the return stroke, you can avoid chipping the carbide tip by bolting a strip of brass or leather to the underside of the tool (see illustration). When the tool rides back, the brass or leather strip pushes the tool up and away from the work, preventing damage to the tool tip.



This is the second of a series of advertisements describing how to get the most effective use from carbide-tipped tools. We will welcome your suggestions—whether or not you use KENNAMETAL. Please enclose drawing (or sketches) whenever possible.

AN ECHO OF THE TOOL SHOW STILL LINGERS TO GREET THOSE WHO FAILED TO GET TO THE SEVERANCE CUTTER EXHIBIT

Your copy of Severance Toollog No. 13 entitled: "Always Say MIDGET MILLING CUTTERS not just Rotary Files" outlines the shapes and sizes of Severance Standard Tools, including "chatterless" countersinks and the NEW, Tube Deburring Cutters. This information is attractively presented in a very concise way; so write for one or more copies TODAY.

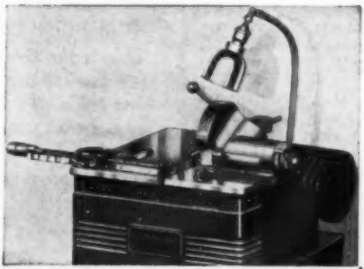
SEVERANCE TOOL COMPANY

Saginaw, Michigan

1510 EAST GENESEE AVENUE

Universal Improves Collet Chucks

As an additional improvement to their line of collet chucks, the Universal Engineering Co. in Frankenmuth, Mich., now announces a new type nut in the three larger collet chuck sizes Z, ZZ, and XZ which is asserted to reduce locking effort by 50%. Whereas the former nut construction tightened directly against the collet, the new design tightens against a floating sleeve. This new method is claimed to reduce friction, making locking easier and more positive. The outward appearance of the nut is also changed. It now is jet black, rust-proof, and fluted for tightening with a spanner wrench.



WORKING UNDER PRESSURE?

Direct, glare-free light on the work is helping many plants *speed production.* VIMCOLIGHTS . . . . low-cost lighting . . . . easily attached, solve many problems.

Hammond Machinery Builders, Inc. use VIMCOLIGHTS on their Glider Trimosaws as shown. Write for details and *prices.*

VIMCOLIGHT

VIMCO MANUFACTURING CO.

109 CHENANGO ST BUFFALO N Y

"Flud-Lite" Eye Shields

A new "Flud-Lite" Eye Shield suitable for use on all Grinders, belt or motor driven is announced by Stanley Electric Tool Division. Fitted with two bayonet type light bulbs it throws light directly on grinding wheel and work. The design and lighting arrangement is claimed to provide 30% more visibility for the operator than previous models. The Eye Shield is adjustable up or down and can be arranged to suit the operator's position. It cannot, however, be moved to a non-guarding position without dismantling. The use of Eye Shields on a Grinder assures the protection of the operator's eyes from particles thrown from the wheel. They are more sanitary than goggles, and being attached to the Grinder, must be used.

Frame is a sturdy die casting, aluminum finish and holds two sheets of glass, 4" x 6"—one piece safety glass with ordinary window glass beneath, which is easily replaced if it becomes pitted by emery dust. The two bayonet type bulbs are made with a supported filament to withstand vibration. The Eye Shield can be set up so that lights work with Switch of Grinder on Grinders with 115 or 220 volt motors. A reflector, mounted behind light bulbs, flood-lights work and wheel. Easy to attach. The Shield comes complete with two light bulbs, bolts and instructions for mounting and connecting.

CRESCENT

Spot Welders

By Designers of Special Welding Machines

1. Easy to operate because of balanced construction.
2. Approved by the Board of Underwriters.
3. Guaranteed for life against mechanical defects so long as machine remains in hands of original purchaser.
4. External adjustment for pressure on welder points.

Agencies Solicited.
Prompt Deliveries.
Quotations Submitted.

Send today for more details.

DAYTON, MARVIN & BAKEWELL, INC.

1939 Santa Fe Avenue Los Angeles, California.

TORIT DUST COLLECTORS

Practical, Modern, Efficient

Our bulletin gives the facts!

Write for a bulletin today!

Guard Your Equipment

Dust from grinding, cutting, or buffing operations may be a grave menace to your equipment. Equipment must not break down. A breakdown means a loss of business, long waits for parts, wasted employee time. Replacement parts may be impossible to obtain.

Full Speed Ahead

In these days of full production, efficient equipment is an absolute necessity. Plants, factories, and shops all over the United States, Canada, Australia, and South America are installing Torit Dust Collectors to protect equipment and guard employees. Torit Dust Collectors are miracle values.

TORIT

DUST COLLECTORS

are individual units easy to install. This is model No. 52 showing the filters, and the metal construction. FREE! Our bulletin gives complete information on sizes, specifications and uses.

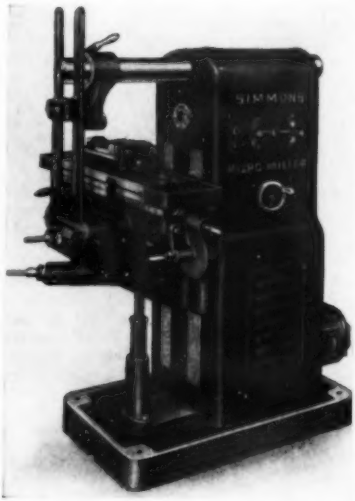
Write for a Bulletin Today!

Air-cooled motor. No heat loss - air is exhausted back into room. One compact unit. New improved filtration. Easy to clean.

TORIT MANUFACTURING CO.
303 Walnut St., St. Paul, Minn.

A-1 Micro-Miller

The Simmons Machine Tool Corp., announces production of a new milling machine for rapid small-parts work. Because prompt deliveries can be made, it is expected to play a prominent part in defense work.



It has been designed for use in plants manufacturing small firearms and airplane parts, toolroom repair shops and, in fact, any institution where numerous small parts are produced. It is also adaptable for use in training schools.

The tool is called the No. A-1 Micro-Miller, and features the Micro-Speed

WIREGRIP Belt Hooks —5 sizes of tough hooks conveniently carded. **No waste.** Makes smooth humpless flexible joint on all flat belts.

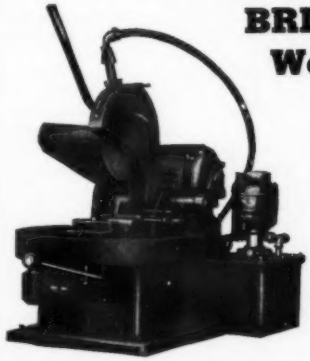
STEELGRIP Lacing—8 sizes, applied with a hammer. For all flat belts on tough drives. Prevents end fraying.

Here at one source are all belt lacing needs, dependable satisfactory products of guaranteed material and workmanship. *Write for Catalog.*

ARMSTRONG-BRAY & CO.
"The Belt Lacing People"
315 N. Loomis St., Chgo. U. S. A.

"ABRASAW"

BRIDGEPORT No. 47W
Wet Cut-Off Machine



More, better and cheaper cuts on practically all materials, are produced by the new Bridgeport "ABRASAW". Cutting speeds are unbelievably fast, material is handled with facility and the polished cuts often eliminate secondary operations.

Capacity 2" in tubing, 1" in solid bars. Our model 48-W handles 3½" tubing, 2½" solid bars.

Let us send bulletin giving full details.

Bridgeport Safety Emery Wheel Co., Inc.
BRIDGEPORT, CONN.

"Its the handiest tool in the shop . . .

We can do SMALL TOOL AND DIE GRINDING CHEAPER ON THIS MACHINE than on our large automatics which not only require greater set-up time but, due to over-travel and less flexibility, longer grinding time, too."

That, in essence, is what users tell us. Machines are moderately priced, so that it pays to install them at points convenient to the men who frequently have small grinding to do.

BUILDERS . PROVIDENCE
IRON FOUNDRY RHODE ISLAND.

Write for Bulletin V-644

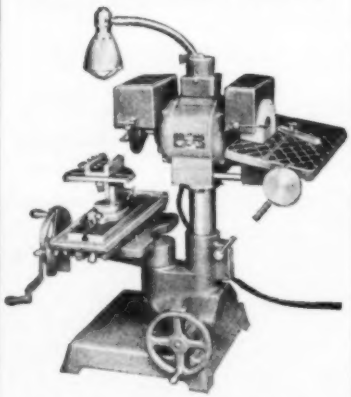
NEW!

Abrasive sheets, ribbons and discs with adhesive backing—no glue required. Instantly applied for sanding, lapping, polishing, finishing, etc. Economical and a real time and labor saver.

Write for details.

MUTUAL ENGINEERING COMPANY
326 W. Third St., Davenport, Iowa.

EVERY MODERN PLANT NEEDS THIS MACHINE



Universal Carbide Tool Grinder

The use of a ½-HP motor on this machine makes it easy to perform every necessary operation for the upkeep of cemented carbide tools.

Ask for Bulletin CTG40-5H.

K. O. Lee Company
Aberdeen, South Dakota, U. S. A.

Drive, the variable speed unit which has distinguished the new Simmons Turret Lathe and standard and heavy duty engine lathes. This drive, mounted inside the column, provides a range of spindle speeds from 38 to 500 r.p.m. at the turn of a handwheel.

The Micro-Miller has the following range of feeds:—longitudinal, 34″; cross 8″; vertical, 18″. Working surface of table is 27″x8″. Feed per revolution of spindle .007 to .100″. Saddle length 27. Diameter of main bearing 3-½″. Length of main bearing 4″. No. 40 Standard flanged spindle nose. Weight net, 2400 lbs. Boxed, 3000 lbs. Floor Space, approximately 64″ x 46-¼″ x 66-½″.

Eye and Face Safeguards

A new catalog - No. 19 is announced illustrating the line of Eye and Face Safeguards made by Sellstrom Mfg., 646 N. Aberdeen St., Chicago.

Included are a number of new products such as the Nos. 3001, 3002, 3003 Industrial Spectacles; No. 421 Industrial Goggle and No. 66 Inspectors' Handshield.

Accurate Repeat Readings from

built-in quality and rugged construction

Model E Indicators

Waltham Dial Gage Co.
STOW, MASSACHUSETTS

Power

Turning the wheels of the factories of the United States requires a total horse power of 51,154,523, according to a report issued recently by the Bureau of the Census.

This official survey of power facilities of American industry covers operations of 1939 and is the first one taken since 1929. It shows that 181,000 factories use power now compared with 193,969 in the boom period.

A trend toward purchased power was noted, for the gain of 1,111,160 horse power in generating equipment in the plants which produced their own energy amounted to only 5.5%. In the same ten year period the gain in installed motors in those plants which buy energy was 7,112,302 h.p., or an increase of 31.2%.

The survey divides American factories into two groups—those having "prime movers," plants to generate their own power needs, and those which purchase power.

The greatest gain in prime mover installation was reported for steam turbines, which increased by 3,564,826 h.p., or 46.1%. Steam engine installation in these establishments decreased by 3,066,675 h.p., or 31.9%. Internal combustion engines increased by 568,958 h.p., or 46.1%, and hydro-turbines and water wheels showed only a slight increase of 44,051 h.p., or 2.9%.

The Census report on power indicates a continued trend toward further electrification of industry. Installed electric motors showed a gain of 10,814,584 h.p., or 30.8%. The factories which had their own power plants reported that they used 65.6% of their power to drive electric generators.

Seventy percent of these generators, as measured in kilowatt ratings, were driven by steam turbines.

GITS
CONSTANT LEVEL OILERS
unbreakable
FIXED CONSTANT OIL LEVEL—is your protection against varying oil levels resulting from tampering and vibration.
Incorrect oil levels cause burned out or flooded bearings. Overcome this trouble with GITS constant oil level oilers.
Complete details furnished upon request.
CANNOT BREAK. BOTTLE NOT MADE OF GLASS
FILL THROUGH BOTTLE NOZZLE
ALWAYS FILL HERE
EXCLUSIVE FEATURE. BOTTLE HINGED TO CUP. PATENTED
BOTTLE WILL AUTOMATICALLY RETURN TO ITS CORRECT POSITION AFTER FILLING
OIL LEVEL ALWAYS CONSTANT
GITS BROS. MFG. CO.
1860 South Kilbourn Ave. Chicago, Ill.
30 years of oil cup experience

Precision Boring Machine Bulletins

Five standard model Precision Boring Machines are described in a series of five bulletins announced by Ex-Cell-O. The two "Junior" machines are a single end and double end type. Three "Senior" models are a single end, a double end, and an extra heavy duty double end.

Address Ex-Cell-O Corp., 1188 Oakman Blvd., Detroit, Mich.

Wrigraph
PRECISION
DRAFTING MACHINE
Brief Case Size Illustrated.
New large INDUSTRO
Drafters available — tubular arm, ball-bearing machines. Complete range of sizes up to 36"x48".
Free trial offer and catalog on request.
Write for literature and prices on Larger Models
L·C·WRIGHT, INC.

Fluorescent Lamp Ballast Catalog

A New Fluorescent Lamp Ballast Catalog has been issued by Acme Electric & Mfg. Co., Cuba, N. Y., covering the entire line of 62 types and sizes of Acme Lamp Ballasts now available for fluorescent lamp application. The manufacturer claims that this entire line of ballasts has been engineered to provide balanced secondary voltages on all two lamp units, thus providing equal voltages for each lamp, and eliminating the situation in which the fixture contains one lighted lamp, and one lamp either not functioning or flickering. It is also claimed that this line of ballasts is free from excessive noise due to the suppressing of normal magnetic hum by impregnation and potting in compound.

With the New Fluorescent Lamp Ballast Catalog, Engineering Service No. 57, is included which contains considerable information of importance to any one considering the installation of this modern form of lighting.

SHELDON Back Geared Screw Cutting PRECISION LATHES

1' Collet Capacity—
Ball or Roller Bearing

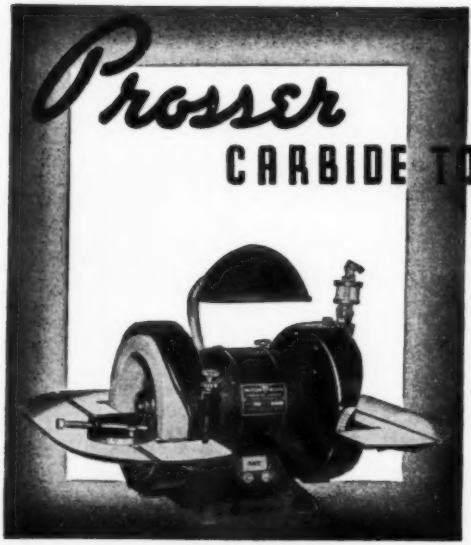
No. BB U-1136 WQ Sheldon 11" swing 36" between centers pre-loaded ball-bearing spindle, hardened and ground all over, inside and out with 1⅜" hole thru center, hand scraped bed, ways (2 V-ways, 2 flat ways) full quick change gear box, worm feed apron with power cross feed, thread chasing dial and 4-speed lever operated underneath pedestal motor drive, and telescopic taper attachment.

Write for Catalog showing complete line of Sheldon Precision Tool Room and Manufacturing Lathes, attachments and accessories; Sheldon Arbor Presses and Sheldon Drill Press and Machine Vises.

● SHELDON MANUFACTURING CO., Inc., 1629 N. Kilbourn Ave., Chicago, Ill., U.S.A.

Prosser

CARBIDE TOOL GRINDER

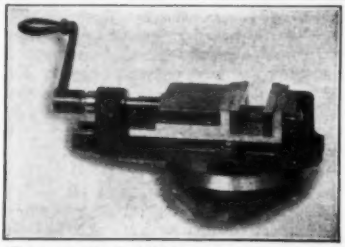


Removes metal fast when rough grinding.
Finish grinds smooth, keen cutting edges.
This grinder will quickly pay for itself by increased tool performance and life between grinds.

$99.50
10 DAYS FREE TRIAL
Write for complete details

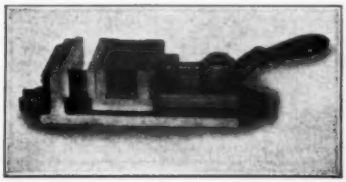
Thomas Prosser & Son
120 WALL ST. NEW YORK

The Modern Swivel Vise



Base graduated in degrees
Alloy steel hardened screw
Hardened & ground jaws
Made in several sizes
Weight 36 pounds
List Price $40.00

The Modern Quick Acting Cam Vise



All steel parts hardened
Hardened alloy steel screw & handle
Hardened & ground jaws
Semi Steel castings thruout
Made in two sizes
Weight 20 pounds
List Price $35.00

Manufacturer of high speed steel and carbide cutting tools.

MODERN TOOLS, INC. E. BERLIN, CONN.

McMAHON
Adjustable Angle Plate
For grinding any angle accurately.
Two sizes
Model "A" with T slots 3½x3½ ..... **$12.**
Model "B" with tap hole 6x7½ ..... **$30.**
Desirable territory open for dealers
FRANK McMAHON CO., 142 JUNE ST., DAYTON, O.

HART'S MILLING FIXTURES

These fixtures will make themselves popular and profitable in your shop. They are easily kept clean to receive the work and may be used in either horizontal or vertical position. Suitable to hold round, hexagonal, octagonal, or square stock, aligning the work with the machine. A very easy setup and fool proof, with a grip that holds the work on the bottom as well as on the back. Shipped in pairs, unless otherwise ordered. Made in 4 sizes—¾" to 4". We can also supply dividing heads to be used with the fixtures.

Write for descriptive circular.

Kindly Mention the Blue Book

HART MACHINE CO.
26 Mather St., Dorchester, Boston, Mass.

Cutting Magnesium Blocks

A special 36" Tannewitz Band Saw with V-belt motor drive has been built for sawing magnesium blocks 30" thick.

To accommodate work of this thickness, the guide rises above the table more than 36". Similar machines, all built with special welded steel frames, are available in any capacity up to those carrying 52" wheels. These are designed for the cutting of various aluminum alloys and pure magnesium. The motor and multiple V-belt drive are mounted at the side.

THE WONDER CUTTER

Cuts wire or rod up to ⅝ inch round (⅜ inch square) and band iron up to ⅛ by 2 inches.

Adjustable stop for repeated cuts to same length. Hardened cutters last indefinitely.

Powerful leverage makes all cuts easy. Small size permits placing wherever convenient.

Small in size but a giant for work. The lowest priced rod and band cutter on the market. Every shop needs one. Hundreds in use.

You can get one for free trial in your own shop.

Write today for further details and price!

THE FEDERAL FOUNDRY SUPPLY CO., 4602 EAST 71st STREET, CLEVELAND, OHIO

DoAll BAND FILES
10 Times as Fast as HAND FILING

SEE HOW DoAll File Bands WORK!

Yes, and 5 times as fast as jig filing. These remarkably efficient files will cut your filing costs way down and produce finished jobs of which you will be proud.

Last 3 times as long as ordinary files.

There are 160 stock DoAll Band Files to choose from—3 different widths, 23 styles, cuts and shapes. There's a correct DoAll Band File for each filing job. Also, specials made to order. *Send for Literature.*

The DoAll Company, Inc.
1206 Thacker St., Des Plaines, Ill.
Associated with Continental Machines, Inc., Minneapolis, Minn.

Flexrock Power Float and Tamp

A new Flexrock Power Float and Grid Tamp are offered as a distinct advance in the application of mastic

floors. It is claimed that the electric float requires less than half the labor formerly required to resurface large floor areas. Drier mixes can be used, and this is said to prevent segregation and assure equal distribution of the aggregate. The use of leaner mixes is also said to effect a saving in cost.

The Flexrock Grid Tamp is claimed to anchor heavy aggregate more securely by bringing the fines to the top. A low water cement ratio is said to reduce shrinkage to a minimum, preventing cracks and checking. The grid tamp is detachable for easy carrying.

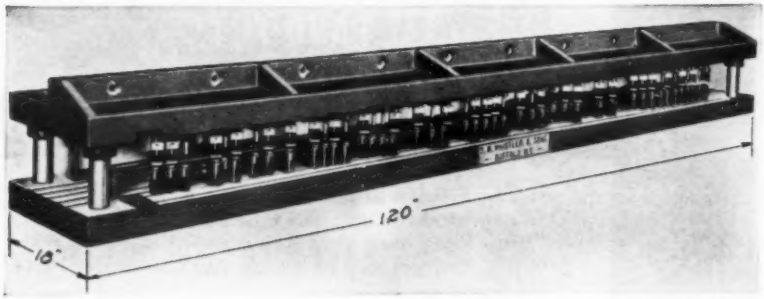
For full details address the Flexrock Co., 2305 Manning St., Philadelphia, Pa.

Small Pivot Ball Bearing

A precision ball bearing for radial or thrust loads or both is announced. This miniature bearing has an outside diameter of 5 m m. and contains 4 1/16" balls. It is designed for pivots incorporating a 60° cone.

Bulletins are offered on this new self-aligning pivot, as well as the same maker's miniature radial ball bearings. Address Miniature Precision Bearings, Lebanon, N. H.

10 Foot Die Shoe Equipped with Adjustable Dies



Interesting evidence of the versatility and adaptability of adjustable perforating dies comes with the announcement of the manufacture of a Die Shoe 18" wide by 120" long for a 10 foot Power Brake.

The important feature is the saving in time and die expense to get into production, and the additional time saved when actually performing the job. In this particular application, an aircraft manufacturer anticipates perforating as many as 100 holes per stroke in Duraluminum sheets used in airplane parts. The illustration shows 44 punch and die units arranged along the front side only, with room available for at least twice as many more.

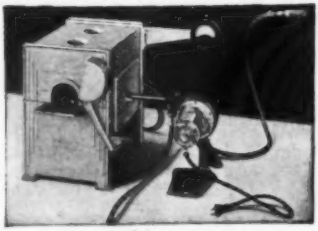
"Stark"

HARDENS ALL TYPES OF HIGH SPEED, ALLOY AND CARBON TOOL STEELS

"ELECTROBLAST"

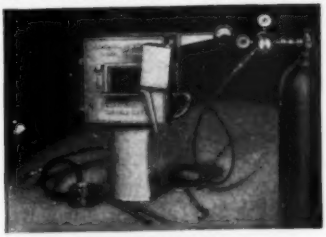
BRAZES CARBIDE TIPPED TOOLS SMALL PARTS EXPERIMENTAL WORK

HARDENING AND HYDROGEN BRAZING FURNACES



FEATURES OF No. 1

1. Just plug it in and operate, no installation costs.
2. Portable Burner.
3. 2350°F. in 15 minutes.
4. Operating cost, 7¢ per hour.
5. Silicon Carbide Muffle 7"x3 1/8"x2 1/8".
6. Available as a Hydrogen Brazing Furnace complete as illustrated.



FEATURES OF No. 2

1. Self contained unit, no installation costs.
2. Built in burners and blower.
3. 2350°F. in 45 minutes.
4. Operating cost, 10¢ per hour.
5. Silicon Carbide Muffle 7"x4 5/8"x3 1/2".
6. Available as a Hydrogen Brazing Furnace complete with Pyrometer.

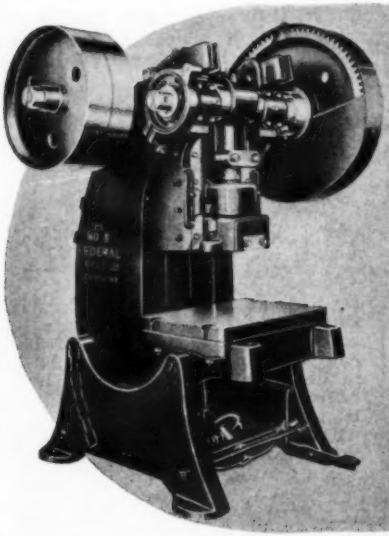
Write for descriptive literature and prices

STARK TOOL CO.

Originators of the American Bench Lathe

Est. 1862 WALTHAM, MASS.

Prompt Deliveries



FEDERAL PRESSES
SPEED UP PRODUCTION

Federal Presses will enable you to march forward. To meet those rising production schedules. To obtain "peak" output. Built to give you maximum service with minimum upkeep.

Whether you are engaged in the actual defense program or not, you always have need for a "good" press. Federal Presses are now being used throughout the country on important government orders.

Let us send you more information on these efficient presses.

FEDERAL PRESS CO.
ELKHART, INDIANA

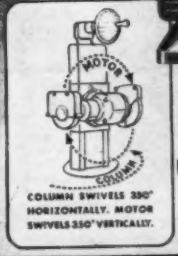
NEW Vernon ALL-PURPOSE GRINDER for TOOL ROOM for PRODUCTION

THE VERNON COMBINATION UNIVERSAL TOOL, CUTTER AND SURFACE GRINDER

For all types of tool, cutter and reamer grinding—as well as internal, external and surface grinding. Exclusive universal pivoting arrangement of grinder motor and motor column permits complete flexibility.

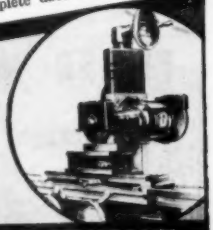
Two-speed hand wheel for longitudinal feed may be operated from front or rear of machine. Table accommodates 16" between centers. Vertical travel of motor —8".

Write for complete data TODAY!



COLUMN SWIVELS 350° HORIZONTALLY. MOTOR SWIVELS 350° VERTICALLY.

... USED AS A SURFACE GRINDER, MACHINE ACCOMMODATES A 6"x12" MAGNETIC CHUCK, AND WILL GRIND A COMPLETE AREA OF 6"x16" (7½" ABOVE TABLE)

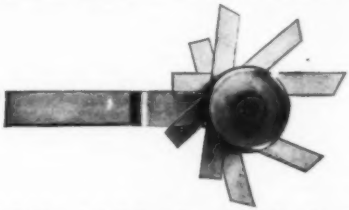


MACHINERY MANUFACTURING COMPANY
1915 EAST 61 ST., VERNON .. LOS ANGELES, CALIFORNIA
The Vernon Line of MILLING MACHINES, JIG BORERS, SHAPERS, and GRINDERS

Obviously, the user of these adjustable dies can instantly rearrange perforating positions, as well as sizes and number of perforations to be made, as these adjustable dies are available in a wide range of sizes from stock. Any manufacturer whose product requires perforating or notching in the course of manufacture, on short or long runs, will find such production equipment very helpful.

A Universal Tool Holder

A "Flexoid" Tool Holder is announced which is readily adjusted to



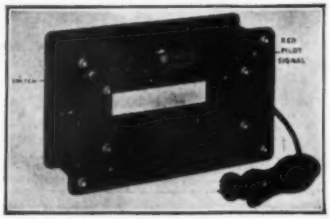
right hand, left hand, or straight shank cutting. No change in centers is necessary when resetting cutter. Made of hard alloy steel, the Flexoid is offered in five sizes ranging from ¼" to ½" cutter square. A tool with Rexalloy bit and a wrench are included.

The Flexoid is manufactured by the Smith Power Transmission Co., 1545 East 23rd St., Cleveland, Ohio.

Handbook on Abrasives

"The ABC and XYZ of Cleaning, Hardening, Surfacing, Relieving Metal Fatigue, Strain, etc." is a small and interesting handbook just issued by The National Metal Abrasive Co., 3560 Norton Road, Cleveland, Ohio. It treats rather extensively on metal abrasives —abrasives of yesterday and those of today; types of abrasives; difference in action between shot and grit; how to figure the price of abrasives you buy; craters caused by peening action of shot; and other pertinent subjects. It is profusely illustrated, containing many tables and charts.

AMC DEMAGNETIZER
A TOOL ROOM NECESSITY



Every tool room needs this simple, portable, sturdy demagnetizer. Small parts passed through the powerful AMC field are instantly demagnetized. Large, flat surfaces can be demagnetized by sliding the device over the surface.

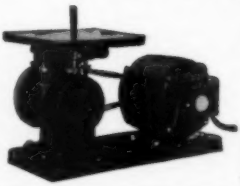
Price is only $32.50, complete as shown.

Write for full information.

ALOFS MFG. CO., Grand Rapids, Mich.

FILING MACHINE SAVES YOU MONEY!

A Postel Filing Machine pays for itself. Filing is made easier. It is twice as easy as hand filing. Positive table lock for precision work. Motors are built for hard daily service.



These models are made of reinforced iron frames. Sold as low as $29.50. Equal to filing machines selling for $50 more! Get full information.

Write for a bulletin today!

Postel Filing Mch. Co.
915 Washington Ave., So.
Minneapolis, Minn.

QUICK-A SPECIALIST!

MILFORD PROFILE SAW is made by a specialist in metal-cutting saw for use on all contour sawing, jig and band saw machines. Its ability to cut more metal faster proves Milford's experience of more than half a century.

For years Milford Profile Saw was largely sold under the private brands of machine manufacturers. Now you can obtain it "right around the corner" at your Mill Supply House where a complete range of sizes, tempers, tooth styles, etc., is in stock ready for delivery by special messenger if necessary.

A machine for contour sawing is no better than its saw. Milford Profile Saw is made by the world's largest, most experienced manufacturer of metal-cutting band saw.

Write for free sample, giving specifications of blade you now use, and make of machine.

THE HENRY G. THOMPSON & SON CO. NEW HAVEN, CONN.

MILFORD

PROFILE SAW — REZISTOR HACKSAW BLADES

SAFETY

ACCIDENTS can be far more costly than inefficient machine operation. *Extra Safety* is built into MARSCHKE Grinders. Work rests of Pedestal and Stand types are mounted on alloy steel wheel guards. In adjusting rests, the operator *automatically* resets spark shields to hug the wheels. Cover flanges keep sparks and chips inside the guards.

Safety is one of the eighteen features accounting for *Marschke's* superior grinding efficiency. Study these in Catalog showing 70 MARSCHKE Grinder and Buffer specifications, 1 to 25 H. P. Write for Catalog TODAY.

These safe Marschke Universal Guards are adjusted without tools.

THE ★MARSCHKE★ LINE

VONNEGUT MOULDER CORP.
1005 MADISON AVE., INDIANAPOLIS, IND

SAVE ON LIFTING
with the Nilson Tilting Wire Reel

Lost motion, false motion and unnecessary motion all cost money. Only a little at a time perhaps, but over the period of a year, the total would be impressive. Why not save this? Useless motion also represents a loss. Lifting heavy coils of wire wastes time and energy. Why not let NILSON save this too?

A foot lever is tripped, the guards removed, a coil of wire slid upon the carrier, the guards replaced, and set screws tightened, an easy lift, and the counter-balancing weight does the rest, bringing the tilting section to a vertical position, ready to feed the wire into the machine.

Send today for Bulletin No. 51 and learn how you save in other ways too.

The A. H. NILSON Machine Co.
BRIDGEPORT, CONN., U.S.A.

Automatic Aircraft Riveters

Signaling their entrance into a new field, the aircraft industry, Chicago Rivet & Machine Co., 1855 So. 54th Ave., Chicago, offers an elaborate 16-page brochure. Four models of their new line of Automatic Riveting Machines, both bench and pedestal types especially designed for setting aircraft rivets are illustrated and described.

All machines in this new line, with riveting throats from 6 to 45", are tooled for setting aircraft rivets up to 3/16" diameter, with a production speed of 1800 to 2400 rivets per hour. All are completely automatic,—feeding, inserting and upsetting the rivets at a single machine stroke.

The edition of the brochure is limited, but until the supply is exhausted a copy will be mailed on request to interested executives of any manufacturer fabricating aircraft assemblies.

Drafting Machine Bulletin

A new four-page folder describing their recently developed, low priced drafting machine, has just been issued by the Drafto Co., 270 Walnut St., Cochranton, Pa.

This folder contains information as to construction, operation details and prices of the "Master-Drafto" Model No. 60 drafting machine. The machine, for center mounting on a drawing board or table, takes a maximum size drawing sheet 24x36". It features scale blades designed to hold any standard size scale, and the protractor device, which has a convenient latching spring for locking the scales at the more commonly used angles, can be set for ½ degree readings.

Two Lincoln Booklets

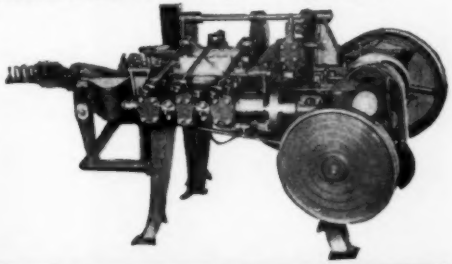
"Weldirectory" is the name of a 56-page booklet announced by Lincoln Electric Co. This useful publication sketches the history of major developments in the arc welding field and gives

CHECK THESE FEATURES

of the Nilson Automatic Metal and Wire Forming Machine

- Open construction of press and forming tools.
- Patented slide feed with an independent cam-operated wire gripping device.
- Power operating wire feed is transmitted through a straight line.

The NILSON AUTOMATIC Metal and Wire Forming Machine meets Today's industrial requirements. Engineered with a 50-year back-ground of experience in designing and building metal forming machines, this S-3-F machine is setting new records in speed and uniformity of products.



Write TODAY for information on all types of metal forming machines

The A. H. NILSON Machine Co.
BRIDGEPORT, CONN., U.S.A.

procedure pointers on "shield-arc" welding. Its greater part, however, is devoted to a detailed description of electrodes and the uses for which they are best suited. Several pages cover other welding supplies and accessories.

A new Lincoln bulletin is also offered describing the latest in "shield-arc" welding machines. This informative brochure describes the various equipment available and goes into considerable detail on the features of latest model welders. The manufacturer emphasizes the job selector and current control, which provide "self-indicating dual continuous control."

No. 12 Lincoln Trunnion Stand

Here is a time saving device that should be useful on radial drills, milling machines, horizontal boring mills, drill presses, etc. It is equipped to handle a fixture holding a part on which several sides require machining operations. The fixture is attached to the trunnion stand and may be indexed from one face to another for operations such as drilling, tapping, boring, reaming and milling, without changing the set-up.

Stands are sturdy and rigid in construction, yet flexible in use. Can be supplied with tailstock, electric light attachment, rotary table and other useful features.

QUICKWORK
STAMPING TRIMMERS ARE SPEEDY—ACCURATE!

Because they are designed primarily for trimming stampings, Quickwork Stamping Trimmers will finish-trim almost every class of deep drawn and irregular shaped stampings without pre liminary roughing cuts.

In addition, Quickwork Stamping Trimmers have many other uses (such as flanging, reverse flanging, beading, and other forming operations) within their regular capacity—often at speeds up to 60 feet a minute.

Combination Stamping Trimming and Forming Machines provide an economical method of beading, flanging and forming —in addition to trimming.

This Quickwork Stamping Trimming and Forming Machine is electric eye controlled to automatically space the rolls so that the stamping and scrap can be easily removed from the machine at completion of each cut.

Before and after views of a variety of stampings—typical of the great number of shapes and sizes that can be economically trimmed with Quickwork.

Quickwork Stamping Trimmers and Shears are built in a full range of sizes. Shipment of many standard models is now possible from stock—subject to prior sale. The Quickwork engineering staff is at your disposal, without obligation, for consultation on your shearing, trimming, flanging and forming problems.

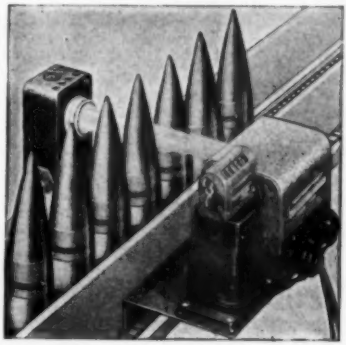
QUICKWORK

Rotary Shears · Circle Shears · Seamers · Beaders · Power Bumping Hammers · Flangers · Stamping, Trimming and Forming Machines

Manufactured by
Quickwork Whiting Division of Whiting Corporation, Harvey, Illinois

Getting the Count—Electrically

Today the Electric Eye is solving intricate industrial problems, practically and efficiently. Durant employs it in connection with their recently perfected Magnetic Productimeter, to meet urgent demands of industry for an electric counting unit that will operate with speed, accuracy and dependability. It may be installed to obtain the count



where otherwise it would be difficult or impossible to obtain it mechanically. It is especially adapted for counting objects of odd shapes and sizes; items that are small and extremely light in weight; and articles whose finish must not be marred during the process of counting.

A very important advantage is that the counter need not be installed at point of contact. It may be placed in an office where the record of production can be taken whenever desired; or, two counters may be used, operated by the one photo-electric control; one at point of contact, the other in the superintendent's office or other strategic spot. The counter has a guaranteed speed of 500 counts per minute, and is available in five or six figures capacity. The illustration shows an application to a conveyor. Interruption of the light beam by each passing shell actuates the counter.

The set comprises three units: — a Magnetic Counter, a Photo-electro Re-

No. 91

WHITNEY LEVER PUNCHES

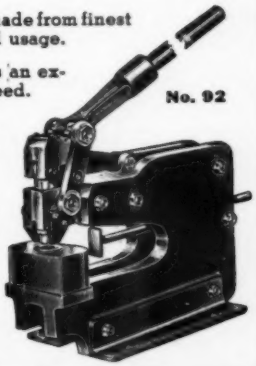
Widest known—Most Universally Used

W. A. Whitney Lever Punches are the choice of over 60,000 satisfied users.

W. A. Whitney Punches are made from finest materials, for extra-long hard usage.

W. A. Whitney manufactures an extensive line to meet every need.

As a result our Punches are reasonable in first cost and low in maintenance costs.



No. 92

The powerful No. 91 illustrated at left is the most powerful punch of this type offered to the trade. It makes a 2" hole in 1/8" iron, 3/4" in 3/16", and 1/2" hole in 1/4" stock.

No. 92, at right, is similar but has 10" throat instead of 5". *May we send you our new catalog?*

W. A. WHITNEY MFG. CO., ROCKFORD, ILLINOIS.

TEMPERING-DRAWING *in the tool room as you* NEED *it for* $265.00*

Despatch

GENERAL UTILITY FURNACE

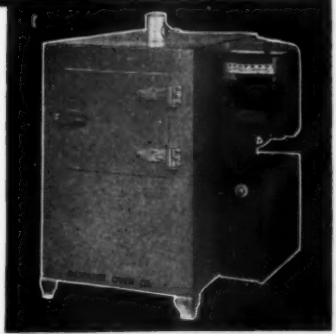
300° F — 1200° F

With the pressure on for uniformly good tools, check your facilities for tempering and drawing tools and dies.

Despatch G. T. 60 Furnaces are compact (inside dimensions 14"x18"x12" high), strong and well insulated; gas or electric heating systems provided. Heating capacity for rapid pre-heating and quick temperature recovery after loading.

*G. T. 60 Furnaces may be provided with Pyrometer for additional charge.

Write for complete details to Dept. C.



DESPATCH OVEN COMPANY

MINNEAPOLIS MINNESOTA

lay (or Control), commonly called an Electric Eye; and a Beam Projector or Light Source. No other contactor is necessary. It operates from a lighting circuit of 110 or 220 volts, 60 cycles, A. C.

Catalog section No. 16, illustrating and describing the equipment will be sent upon request by Durant Mfg. Co., 1928 N. Buffum St., Milwaukee, Wis.

Charts for Apprentice Training

Trade schools and companies with apprentice training programs are being aided by a series of blueprint charts on lathe practice released recently. The three charts now available are:—"Lathe Cutting Tools," "Thread Forms and Formulas," and "60° V-Type Thread Dimensions." Each chart has been prepared at the suggestion of prominent industrial arts instructors and presents reference information useful to the experienced machinist as well as the rookie. The charts measure 16¼" wide x 21" high and are printed on durable ledger paper.

The three charts are being offered for a limited time to industrial instructors and apprentice directors. When requesting the charts, enclose 10 cents in stamps to cover handling and mailing expense. Or the set will be sent free postpaid with each order for the Atlas "Manual of Lathe Operation," a 272-page instruction book covering every phase of modern lathe work ($1 per copy in U. S. A.). Address Technical Service, Atlas Press Co., Kalamazoo, Mich.

YOST DRILL PRESS VISE

This new Yost vise has been designed expressly for use on drill press operations. Does away with special and costly jig fixtures.

Offered in two sizes.

Vise No.	Width of Jaw, Inches	Opens Inches	Weight Pounds
1D	3½	3½	12½
2D	5	5½	23

Do you need a vise of ANY type?

Write today for bulletins on the extensive Yost line

YOST MFG. COMPANY
1335 SO. MAIN ST.
MEADVILLE, PENNSYLVANIA

NUMBERALL
Numbering Machines
Automatic and Hand Operated
for stamping in Metal, Fibre, Plastics, etc. Do faster and better work than Single Steel Stamps.
For Marking Metal Parts, Name Plates, Metal Checks, etc.
Write for Catalog.
NUMBERALL STAMP & TOOL CO., Inc.
Huguenot Park, - - - Staten Island, N. Y.

SHARPLY DEFINED *Scribed Lines*

Micro *Supreme*
LAY-OUT DYE
Manufactured by
MICHIGAN CHROME & CHEMICAL CO.
6346 E. Jefferson Ave., Detroit

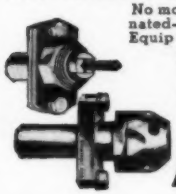
Be Sure to Take Advantage of This Special
TRIAL OFFER
A handy Reference Combination Brush-in Can . . . ideal for shop use and for trial purposes . . . for only
60c

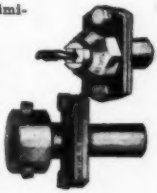
Quick ALIGNMENT OF BUTTON DIES!

The Alco Button Type Die Holder, with its adjustable concentric alignment feature, saves set-up time. Here is all you do—Tighten the die in the die cap, run the die on the work, tighten the two studs, and start your job.

Write for illustrated catalog.

No more torn threads—no taper threads—thread inspection eliminated—less set-up time—longer life from your button dies. Equip your screw machines with ALCO TOOLS.





THE ALCO TOOL CO.

635 HOUSATONIC AVE., BRIDGEPORT, CONN.

Detroit Office: 908 Stephenson Bldg.

ALCO EFFICIENT TOOLS

Portable Electric Grinder

So adaptable and so easy portable that they do yeoman duty on continuous production. Powerful. Lightweight. Streamlined design. Straight line ventilation prevents clogging. Universal motor.

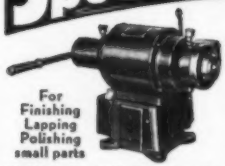
Write for Catalog

THE UNITED STATES ELECTRICAL TOOL CO.

THE GOOD MECHANICS CHOICE

CINCINNATI, OHIO, U.S.A.

SCHAUER Speed Lathes



For Finishing Lapping Polishing small parts

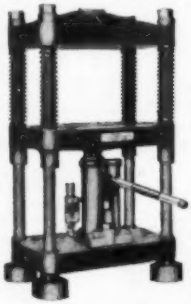
Write for new Catalog No. 400, showing complete line of high production speed lathes — production necessities; time savers in any plant!

SCHAUER 2064 Reading Road, Cincinnati, Ohio

Announcing the

PACIFIC HYDRAULIC PRESS

This Hydraulic Press is a flexible, powerful hand-operated unit. Base and crown platens are made from cast steel. Stroke is controlled by stop collars giving an infinite range from zero to maximum. Automatically cuts out when reaching maximum load. Capacities of 15, 20, 25 and 30 tons.



Let us send full particulars and prices.

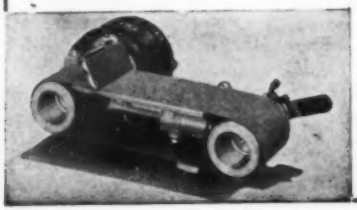
Pacific Hydraulic Press & Tool Co.
P. O. Box 87, Huntington Park Station
LOS ANGELES, CALIFORNIA

"Weld-Master" A. C. Arc Welder

Simplified welding is claimed as the outstanding feature of a new A. C. Electric Arc Welder announced by Ideal Commutator Dresser Co., 1441 Park Ave., Sycamore, Ill.

The design includes a reactance winding on a separate core in addition to the transformer. This reactance winding is said to act as a stabilizer, making it easy to strike an arc and hold it. It is explained that as the distance between the end of the welding rod varies, this reactance winding causes the voltage to vary in proportion.

AN INEXPENSIVE **ABRASIVE BAND GRINDER**



"Built Like A Machine Tool"

The Hormel-M Grinder is sturdily built with a supporting leg under the grinding table to eliminate vibration and tipping due to pressure on belt. Ball bearing throughout, equipped with Alemite lubrication, complete with grease gun.

Write for illustrated folder on this and other styles and sizes.

WALLS SALES CORP.
96 Warren St., New York, N. Y.

"Our Sterling Sander Paid for Itself in 8 Weeks"

— THE MERSMAN BROS. CORP.
CELINA, OHIO

One hand does the work of three.

● *"Our Sterling Sander paid for itself in 8 weeks, through savings in labor and abrasives. Besides, it has solved one of our production bottlenecks."*

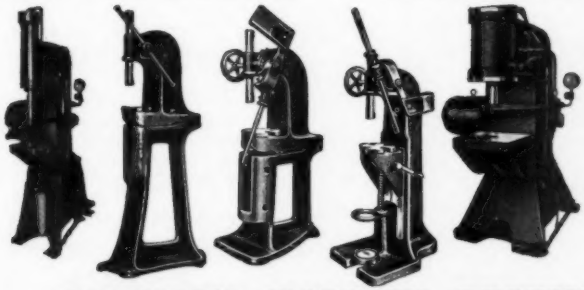
Users everywhere report savings up to 75% on labor and abrasives, with the portable, air-driven Sterling SPEED-BLOC. This modern, high-speed sanding equipment enables one man to do the work of three—better, more uniformly, in a fraction of the time. The Sterling sands flat or curved surfaces—wet or dry—metal, wood or composition. Feathers spot jobs, sands filler coats. And it's easy to operate.

Write for full details.

Sterling
TOOL PRODUCTS COMPANY

357 East Ohio Street, Chicago, Illinois

For AIRCRAFT and MUNITIONS



1883
GREENERD
The Originators of the Arbor Press
1941

PRECISION WORK IN REARMAMENT

65 Standard Styles and Sizes. Manually operated presses ¼ to 35 tons pressure. Motor driven hydraulic presses 1½ to 30 tons pressure.

Let us send you our catalog No. F.

GREENERD ARBOR PRESSES
NASHUA Est. 1883 NEW HAMPSHIRE

Fifteen different welding heats between 20 and 175 amperes are provided. Penetration may be up to ¼" or more if desired.

The standard welder is for 230 volt, 60 cycle operation. Welding rod recommended is 1/16" to 5/32". Primary current 1.75 amps. no load, 52 amps. full load; overall dimensions, 17"x15" x26" high; weight 190 lbs.

TAMMS
BLUE LAYOUT DOPE
For tool and die-makers. Liquid form ready for immediate use! Quick-drying, non-rubbing. Scribe shows clear, distinct line without chipping or scraping off.
TAMMS BLUE CHALK
For checking leaks in castings. Write for Prices
TAMMS PYRAMID PYROMETERS
Portable surface types and instruments for heat treating. *Get Catalog NOW.*
Foundry Division TAMMS SILICA CO.
228 N. LASALLE STREET, CHICAGO, ILLINOIS.

6 REASONS WHY
Aqua-Sol is the solution to your grinding problems

ABSORBS FRICTION HEAT!
ALLOWS GRINDING TO CLOSER LIMITS!
LENGTHENS LIFE OF GRINDING WHEEL!
GIVES A BETTER FINISH TO PARTS!
KEEPS THE WHEEL FREE LOADING!
Nonscratch Drawing Compounds
WAYNE CHEMICAL PRODUCTS CO.
9446 Copeland Ave., Detroit, Mich.

Book on Welding Metallurgy

A 359-page book titled "Welding Metallurgy" is announced by the Lincoln Electric Co., Cleveland, Ohio. It has been prepared under the auspices of Polytechnic Institute of Brooklyn and the New York Section of the American Welding Society. It is based on a series of lectures in a fundemental course in metallurgy and metallography offered at the Institute.

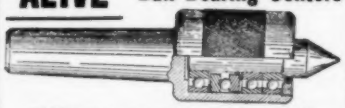
This comprehensive textbook includes such important subjects as temperature changes during welding, types of steel and their manufacture, crystals, weld melts, etc. The second half of the volume discusses heat and time in welding, brittleness, shrinkage, fluxes, alloy and stainless steels, and other pertinent topics.

The book will be sent postpaid for $1.50 per copy.

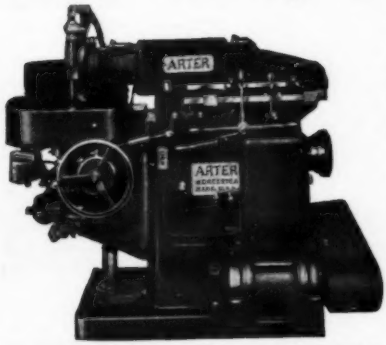
G & N Diecasting Machines

A new catalog on diecasting machines is announced by the G & N Mfg. Co., 11610 Madison Ave., Cleveland, O. They offer high pressure, hydraulic machines which are claimed to exert a locking pressure of 800,000 lbs. The makers declare that most integral parts are made of solid steel plates, flame-cut and welded.

This brochure contains a three-page "unfolder" showing the combination machine for zinc-tin-lead and aluminum - brass - magnesium applications, and also giving specifications.

"ALIVE" Ball Bearing Centers

"They turn with the work"
Write TODAY – and let us tell you more about them.
MODERN MACHINE CORP.
323 Berry St., Brooklyn, N. Y.

Arter Rotary Surface Grinders



MODEL A

Arter Model A Rotary Surface Grinders are mechanically operated and are built in light and heaay series. Model A-1 machines, constantly improved, have been a standard product for nearly 25 years for tool room or light production work.

Model A-3 machines, of heavier proportions, have been progressively developed over a period of years to meet the modern demands for close limit work on volume production.

Model A-1 machines, are offered in 8" and 12" sizes, A-3 machines in 12" and 16" sizes. For grinding larger diameters Arter offers Model B machines. These are hydraulically operated and made in diametrical capacities of 20"-24"-30"-40".

ARTER GRINDING MACHINE CO.

WORCESTER, MASSACHUSETTS

FLEXOID INDUSTRIAL COUPLINGS

Thermoid Hardy Type

A coupling by which ends of shafts are permanently bolted to flexible Thermoid fabric discs—no metal-to-metal bearing surfaces. Provides strong, durable, pliable joint, requiring no lubrication—no attention.

All shocks, vibrations and jolts absorbed—increasing life of driving unit. Operates horizontally or vertically. No back lash—suitable for reverse rotation. Write for data and prices.

FLEXOID COUPLING CO.

The Smith Power Transmission Co., 1545 East 23rd St., Cleveland, Ohio

IDEAL "TRIPLE DUTY"
LIVE CENTERS

NEW

- Interchangeable male and female inserts permit use with all kinds of centered and uncentered work.
- Work with heavier loads at higher speeds.

- Saves hours on centering work.
- Timken Roller Bearing absorbs thrust load.
- Precision Built. All parts hardened and ground.

NEW

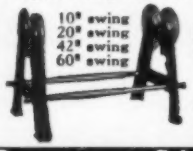
IDEAL
"UNIVERSAL"
METAL ETCHER

- Permanently marks steel, iron and their alloys.
- Four etching heats.
- Compact, everything enclosed.
- Ground clamp for large work.

THREE OTHER MODELS ALSO AVAILABLE

IDEAL ELECTRIC MARKER

- Permanently marks on all materials, glass, metal, ceramics, etc.
- 7,200 cutting strokes per minute.



10" swing
20" swing
42" swing
60" swing

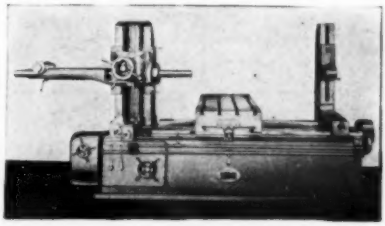
IDEAL
BALANCING WAYS

- Simplify balancing crankshafts, pulleys, flywheels, etc.
- Work carried on free-turning, special steel discs.

Prompt Shipment
IDEAL COMMUTATOR DRESSER CO.
1441 PARK AVE., SYCAMORE, ILLINOIS
"Sales Offices In All Principal Cities"
In Canada: Irving Smith, Ltd., Montreal, Quebec

Horizontal Boring Mill

A new Yoder horizontal boring mill is announced. Of improved Lambert design, the travel of table on bed is 52" with power. Cross feed to table with automatic stop is 36".

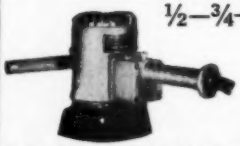


This boring mill features vernier scales on head, column, and outer support. Power driven rapid traverse is provided for all movements. Milling cutters and other attachments may be bolted directly to a flange on the outer end of the spindle. Sixteen power speeds are available for head, saddle, and table in any direction. There is a power driven rapid traverse for nearly all movements.

Electrical and Lubrication Devices

Trico Fuse Mfg. Co., 2948 No. 5th St., Milwaukee, Wis., offer Catalog 50 filled with valuable information on obtaining maximum fuse protection - removing and replacing fuses safely - eliminating poor contact between fuses and clips—and lubricating all types of bearing surfaces with modern, visible, automatic oiling devices.

CUTS GRINDING COSTS
½—¾—and MORE
HEAVY DUTY
3 Phase
60 Cycle
No Brushes



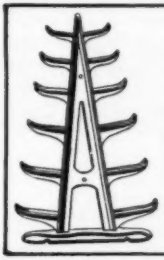
GASTON POWER TOOLS
2655 W. 95th St., Evergreen Pk. Ill.

Precision Lathe for Small Work

The new South Bend Model A 9″ swing Tool Room Precision Lathe is well adapted by its size and design for small diameter work, requiring a high degree of accuracy and sensitivity. It has a maximum collet capacity of ½″, maximum swing over bed ways of 9-⅛″, and a maximum swing over saddle cross slide of 5-½″. Three bed lengths are available, providing center distances of 16″, 22″ and 28″ respectively.

Twelve spindle speeds ranging from 41 to 1270 r.p.m. are provided on motor drive models. Smooth operation at high speeds is attained by using a direct belt drive to the spindle for speeds above 400 r.p.m. A wrenchless bull gear lock permits engaging the back gears quickly when slow speeds are required for machining large diameters.

A series of 48 power longitudinal feeds, 48 power cross feeds and 48 pitches of screw threads, right or left hand, are provided by the quick change gear mechanism. The full automatic apron is equipped with a powerful worm drive and friction clutch for operating both the automatic power cross feeds and the automatic power longitudinal feeds. An automatic safety interlock prevents engaging the half nuts when the power carriage feeds are in use.



"CHAMPION"
Steel Racks

Save time, steps and money by keeping bar stock, shafting and pipe out of the way and off the floor.

Write for full details.

The Western Tool & Mfg. Co.
Springfield, Ohio

OPEN THE WAY TO GREATER PROFITS

BY USING S & S HINGES

BUTTS AND CONTINUOUS LENGTHS — for GUARDS — CABINETS — CASES — BOXES — LUGGAGE

WRITE FOR CIRCULAR

S & S MACHINE WORKS

HARDWARE DIVISION

4539 WEST LAKE STREET CHICAGO, ILLINOIS

RECLINABLE POWER PRESSES

We manufacture a complete line of mechanical power presses, with sizes and types for every need in your shop.

Write for bulletins.

ZEH & HAHNEMANN CO.
Newark, New Jersey

TANNEWITZ DI-SAW

SAVES AN AVERAGE OF $4.80 EACH HOUR IT'S USED

Inside and outside cuts on dies, shoes, templets and endless other jobs can be done in a small fraction of the time required by former methods. Saws, files and polishes. A highly developed, large capacity machine.

Write for literature.

THE TANNEWITZ WORKS
GRAND RAPIDS - MICHIGAN

Equipment supplied includes the hand wheel type draw-in collet chuck, collet rack, taper attachment, thread dial indicator, micrometer carriage stop, and chip pan. Other attachments supplied to order include an electric grinding attachment, milling attachment, oil pump and piping, chucks and accessories.

It is made in floor type with pedestal motor drive, as illustrated; also in bench type with motor drive, and in both bench and floor types with countershaft drive.

Equipment supplied with this lathe includes the hand wheel type draw-in collet chuck, collet rack, taper attachment, thread dial indicator, micrometer carriage stop, and chip pan. Other attachments supplied to order include an electric grinding attachment, milling attachment, oil pump and piping, chucks and accessories.

This new Tool Room Lathe is made in floor type with pedestal motor drive, as illustrated, also in bench type with motor drive, and in both bench and floor types with countershaft drive.

—GEARS—

Spur—Helical—Worm—
Bevel—Miter, Etc.

We do broaching and all kinds of grinding.

We specialize in grinding hardened steel bushings, cam rollers, etc.

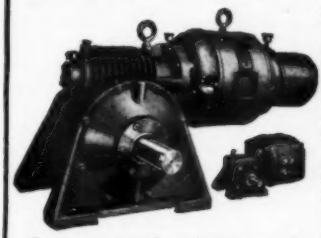
Prompt service and quality has retained a large list of customers for 25 years.

TAYLOR MACHINE CO.
1919 E. 61st St., Cleveland, Ohio

Janette Speed Reducers

FOR YOUR SLOW SPEED MACHINE TOOL DRIVES

1/50 to 10 H.P. **.08 to 1140 R.P.M.**



See our speed reducers at the A.S.T.E., booth 378, Machine & Tool Progress Exhibition at Detroit, Mich., March 24-29.

This company is operated by the original founders. We are small enough to be flexible without red tape and to take a personal interest in every customer; but large enough to have an established, international reputation for building only high quality, reliable machines, which are sold by our world wide sales organization.

Janette is one of the very few companies who build BOTH motors and gear boxes. Janette motors are designed especially for use with speed reducers. All machines are built complete in our own factory, by our own organization. There is no divided responsibility for the performance of the gear box or motor.

SEND FOR OUR 100-PAGE CATALOG

Janette Manufacturing Company
558 West Monroe Street Chicago

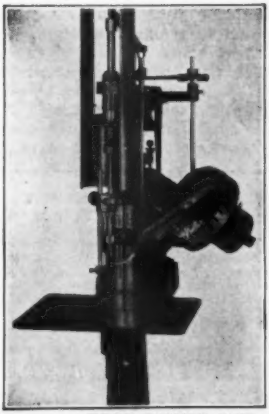
USE DETROIT POWER SCREWDRIVERS

FOR PRODUCTION ECONOMY

THESE MODERN MAGAZINE-FEED POWER SCREWDRIVERS ARE USED BY HUNDREDS OF MANUFACTURERS.

NO JOB TOO TOUGH.

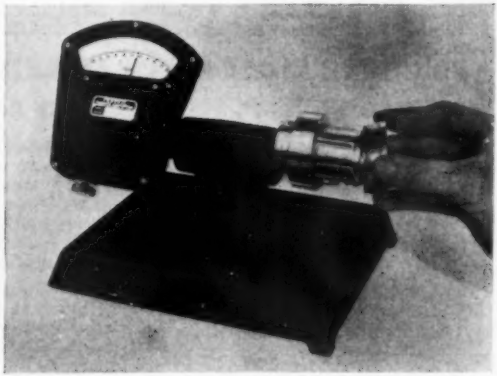
SEND SAMPLE ASSEMBLIES FOR PRODUCTION ESTIMATES.



DETROIT POWER SCREWDRIVER CO.

5363 ROHNS AVE., DETROIT, MICHIGAN

Precision Gaging Aids



Two new types of Federal gages have been developed recently.

Of these, the Model 264 P-series is a modern type of Dial Indicator Snap Gage. It is emphasized that the inspector can see exactly how the work varies in diameter from the master or specified dimension. With the old "feeler" type Snap Gage with "Go and No-Go" contacts, the inspector could not tell exactly how far "off" the work was. There was always an element of doubt as to whether one workman would force the test piece between the contacts harder than another. Another advantage of this gage is its speed, for in operating "feel" type gages it always takes considerable time for one to "feel" the work as it is tested with the gage, whereas with this new gage, the inspector sees immediately the actual comparision of the work with specifications.

The gage has an adjustable lower anvil with a rounded lip for easy insertion of the work. The upper anvil operates under an auxiliary spring tension which maintains constant pressure at all times on the work. The backstop is also adjustable over various diameters. The frame is made of Dowmetal, making the whole gage light and convenient to use. The gage can be made for any diameter from the smallest fraction of an inch up to many inches in diameter.

The other newcomer is the Model 1202 B-5 bench type Plug Gage shown on the right. This is a mechanical gage

NEW HEAVY DUTY BENDER

The users of the original small Micro Bender (No. 1) are so enthusiastic over its precision work, ease of adjustment and adaptability to many uses, they have repeatedly asked us for a larger machine to do heavier work. In response to this demand, we announce

"Micro" BENDER No. 2—Bends ½" Cold Rolled Steel Bar

or larger sizes of other more ductile materials in proportion. Handles round or square tube, angle, channel, wire, strip stock, etc. The range of contour bending and die duplicating operations is limited only by bending qualities of material used.

Write today for prices and circular—
"Metal Duplicating Without Dies"

O'NEIL-IRWIN MFG. CO., 314—8th Ave. So., Minneapolis, Minn.

Net Weight 130 lbs.

Fig. 705

IF NEATNESS AND CONVENIENCE COUNT IN YOUR SHOP . . . .

YOU'LL WANT THESE

"HALLOWELL"

TOOL STANDS & CABINETS OF STEEL

Fig. 1748

Fig. 705 shows an open type steel stand which keeps tools handy and in order. Rolls easily right to the job—saves steps, time and money. Fig. 1748 illustrates a steel cabinet where tools can be safely kept under lock and key. Write for details and prices or ask your distributor.

STANDARD PRESSED STEEL CO.

JENKINTOWN, PENNA. BOX 889

— BRANCHES —

BOSTON • DETROIT • INDIANAPOLIS • CHICAGO • ST. LOUIS • SAN FRANCISCO

"YOUR BEST DEFENSE"

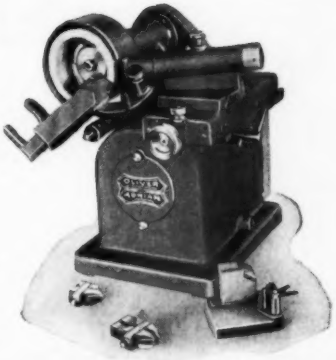
Against scrap, slow downs and waste in your plant is the proper grinding of cutting tools.

OLIVER OF ADRIAN

Can provide the best methods for sharpening your DRILLS, CUTTERS, TAPS, etc. *A method* that assures longer tool life, more accurate work, increased production.

Send for literature on:

Drill Grinders, Face Mill Grinders, Tool and Cutter Grinders, Tap Grinders, Tool Bit Grinders.



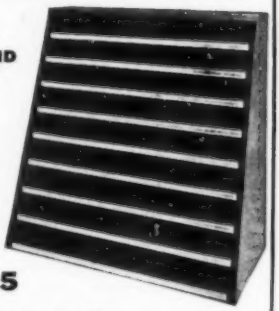
Cut illustrates No. 21 Bench Drill Grinder for Drills 3/32 to 1/2".

OLIVER INSTRUMENT COMPANY

1408 E. Maumee St., Adrian, Michigan.

TOOL STORAGE UNITS

SLOPED DRILL AND REAMER UNIT



$34.15

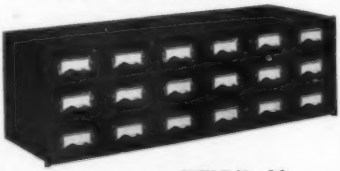
F. O. B. Cleveland, Ohio

STYLE No. 22 SLOPED DRILL AND REAMER UNIT For the storage of various lengths of drills, reamers, arbors, etc.

34" W x 34 5/8" H
Top 6¾" D
Bottom 17" D

Contains 108 compartments 2¾" W x 1⅛" H, with label holders.

BOX DRAWER UNIT



$22.95

F. O. B. Cleveland, Ohio

STYLE No. 10
18 DRAWER INSERT UNIT
For small parts
34" W x 10¾" Hx11¾ D
Drawers 5¼" W x 2¾", H x 11½" D
2 adjustable dividers per drawer

BINS — BOXES
SHELVING
TABLES — DESKS
CABINETS — LOCKERS

THE INTERIOR STEEL EQUIPMENT CO.
2352 EAST 69th STREET
CLEVELAND, OHIO

of extreme accuracy designed for bench use, and having the characteristics of a fixed type Plug Gage, but with the advantages of the speed and certain inspection of a Dial Indicator Gage.

The Dial Indicator on this particular gage reads in .00005" and even finer readings of .000025" can be estimated on the dial.

A particular advantage is its "repetition" quality. Motion of the contact point is transferred directly to the indicator through one solid continuous unit eliminating chance of error due to bearing fits, friction, etc. The sensitive contact point is located underneath the plug and there are two horizontal locating points, one of which is shown part way up on the plug. The locating contacts are interchangeable for different sizes of holes. The guiding tip, over which the ball bearing raceway is being slipped, is also interchangeable for different sizes. The stop collar surrounding the plug is also interchangeable for size, and can be adjusted anywhere on the block so as to locate the work directly over the contact where it is desired to check the diameter.

Cataloging Kennametal Tools

A new 32-page catalog of Kennametal steel cutting tools and blanks has just been issued by McKenna Metals Co., 135 Lloyd Ave., Latrobe, Pa. Known as Catalog No. 41, it lists specifications and prices for five styles of blanks, 28 standard tools, and several semi-standard tools; as well as lathe and grinder centers supplied with Kennametal nibs.

The principal departure from the previous catalog is that prices of blanks and semi-finished tools have been listed. List prices for blank weights from 1.00 to 1000.00 grams are tabulated.

New tools illustrated and described include new styles of facing tools for turret lathes, new styles of box turning tools, tools for shell turning in automatic lathes, and a series of boring tools having rake angles to adjust for radial rake angles in small and medium holes.

NICHOLSON CONTROL VALVES

are made in two, three and four-way types for air, oil, water, steam, gas, etc., pressures to 5000 lbs. Style E is a general purpose valve for pressures to 300 lbs. Various metal combinations to suit any medium. Style J is for air and oil only, pressures to 125 lbs. Style H is a balanced hydraulic valve for pressures to 5000 lbs. We also manufacture foot, solenoid and motor-operated valves.

Style J

Style E

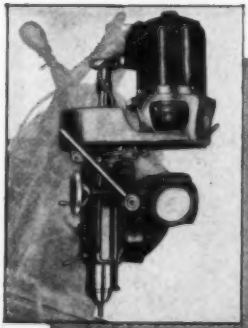
Style H

Bulletins on request.

OTHER NICHOLSON PRODUCTS: Mandrels, Arbor Presses, Flexible Couplings, Steel and Stainless Steel Floats, Steam Separators, Steam Traps, Air Separators, Air Traps, Air Vents, Etc.

W. H. Nicholson & Company

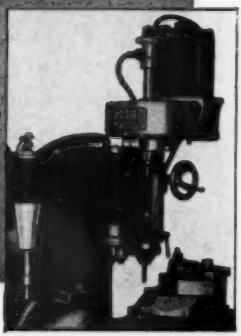
117 OREGON STREET WILKES-BARRE, PA.



EKLIND UNIVERSAL MILLING HEAD AND TURCHAN HYDRAULIC DUPLICATING UNIT

Model 4 HC Eklind Turchan Duplicating Attachment is designed and priced for die shops making Bakelite, Plastics, Rubber and Drop Forge molds and dies. Will handle average work efficiently, economically and speedily. Oil pressure controlled by tracer, feeds spindle and tracing arm to follow model accurately. Die capacity is 16" long by width, depending on cross feed of machine. Capacity can be increased by mounting head on side of overarm.

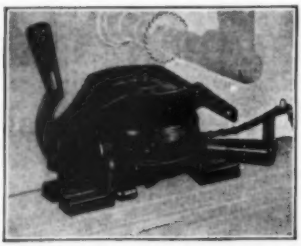
Model 4 H Eklind Universal high speed Milling, Drilling and Boring unit is a most valuable tool room aid. Can be had separately and the duplicating attachment added later.



Send for our bulletins giving full details and prices.

UNIVERSAL HIGH SPEED TOOL CO.

549 W. Washington Blvd., Chicago, Ill.



DEARBORN Automatic Chucking and Indexing Fixture
MILLS OVER 1000 PARTS PER HOUR

Work held by draw in collets. Collets open and close automatically. Work automatically ejected. Indexes without loss of time for milling 1, 2, 3, 4, 6, 8, 12 or 24 sided pieces. Minimum set-up time required. Speeds up production. Positive and accurate in operation.

J. W. DEARBORN
72 S. CLIFF ST. ANSONIA, CONN.

MAKE SPRINGS *in a jiffy!* *with* **Blaner Universal Hand SPRING WINDER**

Here's a profitable tool room unit. Quickly makes hundreds of sizes of springs. Sturdy, dependable . . . a real time and money-saver.

Illustrated is No. 4 Universal with adjusting shaft of 5/8" square. Takes wire up to 1/4" diam.

Patent No. 2052443
Write for your Circular.

THE JOHN BLANER CO.
Corner Meek & Elm, Sharon, Pa.

Preventing Burned Hands

In the manufacture of Westinghouse sealed-beam head lamps, they are carried out of an annealing furnace on a moving conveyor. Operators remove

the lamps from the conveyor with their gloved hands. The lamps are so hot that even with asbestos gloves, scorch burns and blistered fingers from the continual heat were not unusual.

Borrowing an idea from beauty shop practice the operators' gloves are now air conditioned. A low pressure air hose extends into the gauntlets of the gloves to provide circulation of cool air which effectively prevents burns.

A surprise effect of the air conditioned gloves stunt was that it made a better product possible also. The circulating air gives less shrinkage in the lamp glass because it permits change in the pre-heat temperature.

A Vertical Thread Grinder

A vertical thread grinder, said to be one of the first in the industry, has just made its appearance.

It marks a departure from the conventional design of thread grinders. In-

B-LINE
PEDESTAL & BENCH GRINDERS

THE DE LUXE Model, shown here, is available in both Pedestal and Bench types . . . . . with all Safety Features. Patented wheel lights combined with spark arresters over each wheel . . . . . Adjustable Tool & Safety Glass Eye Shields. DE LUXE MODELS FROM ½ to 1 H. P. HEAVY DUTY MODELS FROM ¼ to 5 H. P.—TWIST DRILL GRINDING ATTACHMENT FOR 7" to 12" WHEELS FURNISHED AS EXTRA EQUIPMENT IF DESIRED. QUICK SHIPMENT. WRITE FOR SPECIAL BULLETINS TODAY . . . . .

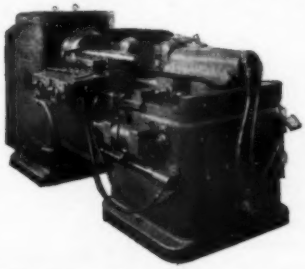
The Brown-Brockmeyer Co., Inc.

Leading Independent Motor Mfrs.

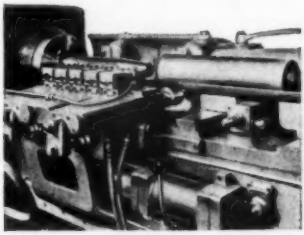
DAYTON -:- OHIO

MOREY "27" Semi-Automatic Lathe for Rough Turning 155 MM Shells

Minimum cutting time—maximum feed and speed to work that tooling will permit. Loading time from conveyor to belt about 5 seconds.



MOREY "27" Semi-Automatic Lathe tooled for rough turning, cutting off, and facing 155 MM Shells. Machine shown with hydraulic arbor and tailstock in loading position.



Close-up of MOREY "27" Semi-Automatic Lathe, tooled for rough turning, cutting off and facing 155 MM Shells. Machine shown with rough forging, ready to slide on the arbor.

Write for detailed information.

MOREY MACHINERY COMPANY, INC.

410 BROOME ST., NEW YORK CITY

stead of approaching the work from the side, the wheel does it from above. In this position the head is directly over its own base and a constant equilibrium is maintained. The weight is always down on the feed screw and a natural condition for maintaining size of work is thus insured.

Being in an upright position the unit conserves floor space. It has a capacity of 18″ between centers, 6″ in diameter, and can produce 10″ length threads any place on the 18″ shaft,

right or left hand, with the same lead screw.

The head pivots and can be set accurately to a maximum of 25° either side of center to produce right or left hand threads of any standard or special forms.

A cam arrangement having a master cam with an adjustable fulcrum block and pick-off gears provides for the making of variable relief on any number of flutes in taps.

The machine occupies floor space of 38″x48″, and stands 78″ high.

MODEL NO. 16 "SPECIAL"

Constructed as per Specifications of U. S. Naval Aircraft Factories

Reg. U. S. Pat. Off.

Beware of Imitations! Our machine carries the Butterfly trade mark.

BUTTERFLY FILING and SAWING MACHINE

(Die Making Machine)

This is a very heavy, powerful machine and is designed for extra heavy filing and sawing, but it performs small work just as well. This type of machine is usually adopted in Ammunition Plants, Airplane Factories and machine shops where heavy and precision filing and sawing is desired. We also manufacture smaller models—Model D-10" Table; Model No. L—12" Table.

HARVEY MANUFACTURING CORP.
161 Grand St., New York
Phone: CAnal 6-5170

GOOD NEWS!
for DIE MAKERS

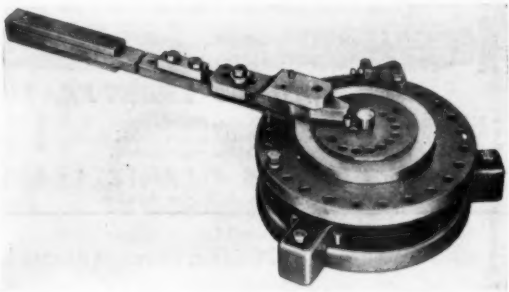
Transfer Points Eliminate Guesswork in Die Making

There's no chance for error when you use transfer screws as markers in setting dies. Points are of uniform height above hex base. Six accurately made and hardened screws nest in a special holder with hex wrench tip. Made in ¼" to 1" diameters.

3/16"	$1.50 per set	5/16"	$1.25 per set	7/16"	$1.40 per set
1/4"	1.20 " "	3/8"	1.35 " "	1/2"	1.50 " "

HEIMANN MFG. CO., URBANA, OHIO

Micro Die Duplicating Bender No. 2



A new O'Neil-Irwin Die Duplicating Bender No. 2 is announced. This sturdy bench device is intended to handle ½" cold rolled steel bar, forming it cold to ½" radii, with greater capacity of other more ductile materials in proportion.

It is claimed that this bender will economically duplicate ductile materials of solid cross section to shapes and outlines of regular or irregular radii to tolerances usually expected with forming dies.

Ductile materials of open or irregular cross section may be bent with the aid of simple conversions which can be made of stock materials.

A die duplicating bender of this type has a wide variety of applications. It is valuable in producing duplicate metal pieces on a limited production basis, often eliminating the need for dies. It also has found use in the making of complicated dies.

DoAll Catalog

A new catalog is announced describing the DoAll line of contour sawing machines and accessories, made by Continental Machines, Inc. This attractive spirally bound booklet contains a wealth of valuable information on contour sawing as compared to other machining methods and is especially directed at trade and vocational schools and other training centers.

Tool Steel Handbook

"Tool Steel for the Non-Metallurgist" is the title of a useful booklet just reissued by the Crucible Steel Co. of America, Chrysler Bldg. New York. This handy manual contains elementary information on the four basic types of tool steel and suggestions as to their heat treatment, quenching, and tempering. It should prove of value to many shop executives.

"ALNOR" Velometer

An All Purpose Air Velocity Meter

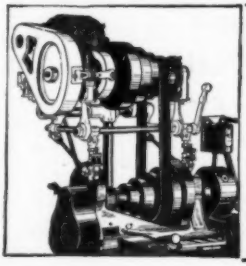
—Instantaneous, Direct Reading.

Measures total and static pressures as well as velocities.

write for catalog

ILLINOIS Testing Laboratories, Inc.

150 W. Hubbard, Chicago



Worried About Costs? Forget It!

Clip up to 50% off your power costs by installing Remco Motor Drives on your present shaft driven tools. Apply power when and where needed. Only Remco Drives take ANY reasonably sized motor—new, or USED. No need to buy new motors, or new machines. Saving on belting alone often pays for complete Remco installation. Write for folder. Remco Products Corp., State and Hay Streets, York, Pa.

REMCO MOTOR DRIVES

for LATHES, SHAPERS, DRILLS, MILLING MACHINES, etc.

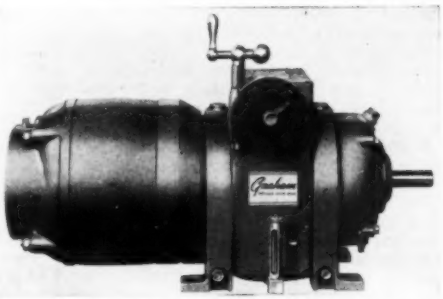
EVANS *High Speed Steel* REAMERS

LOOK AT THESE FEATURES

- No honing.
- Will not chatter.
- Chrome-like finish.
- Perfect alignment.
- Full bearing surface.
- Left and right spirals.
- 50 to 80 thousandths expansion.
- Cannot fall in slots or oil grooves.
- Extension pilots for line-up work.

WILL SHIP ON 30 DAY'S TRIAL | **EVANS FLEXIBLE REAMER CO.** Ravenswood & Wilson Ave., Chicago, Ill. | WRITE FOR CIRCULAR

Metallic Traction Manual



The principles of metallic traction, with explanatory curves and diagrams, are said to be set forth for the first time in the Graham manual No. 501. Included is a description of the reversing feature, available on some Graham variable speed transmissions, which delivers equal speeds forward or reverse (both sides of zero) without stopping or reversing the motor. The manual also summarizes the applications of various types of variable speed transmissions, and states when and when not to use a unit of the Graham type.

Complete data on these variable speed transmissions is given in the manual, together with illustrations and notes on typical installations. Illustrated and described in detail are such features as the ability to deliver full torque over the entire speed range from maximum to zero; ability to hold selected speeds closely without cyclic variation and to obtain pre-selected speeds accurately on reset. The reversing feature mentioned is of special value in applications to sighting, aiming and steering devices.

In addition to the three sizes of units now available, ⅛ to 1½ h.p., a fourth

STYLE A

***The* HAMILTON PORTABLE ELEVATING TABLE—"PORTELVATOR"**

No strained backs or bruised fingers if you let the Hamilton "Portelvator" do the lifting for you.
Use it as means of support—Use it to level large overhanging pieces of work—Use it as a bench to work on—An economical and efficient helper—One to twenty ton hand or power operated.

Write for full details today.

THE HAMILTON TOOL COMPANY
Ninth and Hanover Streets, HAMILTON, OHIO

Small Work Held Securely *with this Handy Drill Jig*

A. S. A. Standard bushings with liners to drill any size hole up to ¼" diameter. One bushing furnished with Jig. V block to center work. Can be made any form for holding special pieces. Locking handle can be reversed for either hand.

Self contained and well built. Quick to change for length and diameter, for both shoulder work and gauging from the end. Chips fall away from gauging parts.

Let us send you more information.

RACINE SCREW WORKS
RACINE WISCONSIN

The REID No. 2-1 Automatic Feed SURFACE GRINDER

DESIGN—Mechanical and Hand Feeds with a reciprocating table and horizontal spindle.

CAPACITY—The No. 2-1 Surface Grinder grinds work 18" long, 6" wide and 11½" high, using a wheel 7" in diameter.

SPINDLE—High-grade heat-treated Chrome Molybdenum Steel; runs in phosphor-bronze boxes. Vertical adjustments are obtained by a hand wheel graduated to .0005".

WORK TABLE—Automatic in both directions and is controlled by dogs operating against a reverse lever.

MOTOR DRIVE—Machine requires a 1½" HP, 1800 RPM Motor. Motor is entirely enclosed in base of machine.

FLOOR SPACE—65" x 30".

Exclusive Selling Agents

H. LEACH MACHINERY CO.
387 Charles St. Providence, R. I.

Send for Circular.
Distributors in all leading Cities.

THE HANDIEST RACK YOU EVER SAW

Greatest capacity — Smallest floor space

4 arms, 51" high, stacks 10,000 lbs. flat or round stock. 3 stands for 20' lengths; 2 for 12' or shorter. Use against wall or back to back in center of room. Cost is small, value big.

Write for circular and prices.

Wm. S. Yohe Supply Co.
503 Mahoning Rd. N. E., Canton, O.

Tapping As Fast As You Can Drill . .

with the A. M. Sensitive Tapping Machine . . . from the smallest and finest up to 5/16" diameter in steel and iron—and up to 1/4" in softer materials. A modern unit that within its capacity, will take all the punishment intense production can inflict.

Write TODAY for this sure solution of your small tapping problems.

A. MUEHLMATT DIVISION
OF
THE HAMILTON TOOL CO.
Ninth and Hanover Streets,
HAMILTON, OHIO

unit for 3 h.p. drive will soon be in production. These sizes are offered in standard, geared reduction and geared step-up types for either built-in or coupled motor mountings.

Copies of the manual may be obtained by addressing Graham Transmissions, Inc., 2711 N. 13th St., Milwaukee, Wis.

Planer Limit Switches

Planer limit switches for the machine tool industry are described in a new leaflet.

Application and construction of the 2, 4, and 6 pole switches are discussed. The "quick made" and "quick break" mechanism consisting of a horseshoe-shaped spring under compression is described.

Features of the switch are clearly shown by an illustrative "breakdown" of the essential parts.

A copy of Descriptive Data 15-075 may be obtained from department 7-N-20, Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

MODERNIZE PRESENT EQUIPMENT

Russell Boring Bar bores 5/16" to 12" dia. with boring axis parallel to shank axis. One compact tool, with micrometer adjustment.

RUSSELL BORING BAR CO.
Middletown, Ohio

Why Not Buy The Original Electric Etcher?

MARK IRON AND STEEL

THE ETCHOGRAPH WAY

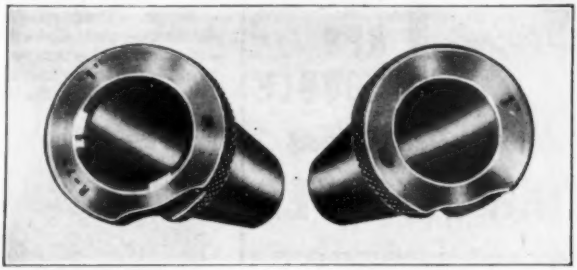
New ELKONITE TIP pencil.
New Baby Grand Model at a lower price.

2,000 in use

BREWSTER - SQUIRES CO.
42 Church St., New York, N. Y

A DOUBLE BARREL SHOT

at bushing require-ments



The A.S.A. and Acme Standards together give the most complete range of bushing sizes available.

This means a Standard bushing for nearly every requirement, less chance of delay through ordering "specials", and therefore greater convenience and speed in the manufacture of your jigs. (See page 2 of our bushing catalog.)

ACME INDUSTRIAL COMPANY

Specialists in Flat and Cylindrical Lapping

210 N. Laflin St., Chicago, Ill., MONroe 4122

DON'T LET CUTTING OFF HOLD UP PRODUCTION

Luers Patented Cutting-off Tools Eliminate the Three Big Causes of Cutting-off Troubles

These tools deliver more work at lower costs because the patented design of the blade provides adequate side clearance, adequate back clearance and freedom of chip expansion. Note these three features found only on Luers blades —

The T-shaped blade prevents excessive side friction —

The taper insures proper back clearance throughout the entire length of the blade —

The concave top cuts a curled chip, free to expand without binding.

These result in a finer, aircraft finish, fewer blades used, less time consumed in removing, grinding, inserting and resetting.

Holders are available for all types of automatic and hand screw machines.

Produced under license issued by John Milton Luers Patents, Inc.

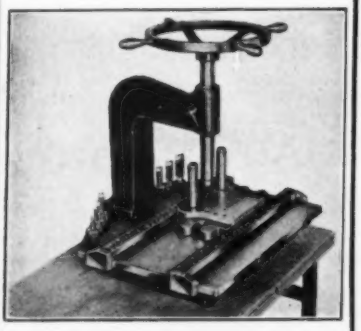
Write For Literature.

Tell us the makes and models of your equipment, and we'll send full information promptly.

EMPIRE TOOL CO. 8790 GRINNELL AVE. DETROIT, MICHIGAN

Save TIME TAPS TROUBLE with the New

VIKING TAPPER



You save time because the Viking Tapper eliminates the wasting of valuable time by highly paid skilled men trying to tap holes accurately by hand. One fifth the time is required.

You save taps because tap breakage is practically done away with. This enables the use of high speed ground thread taps at lower cost than carbon taps. The savings on taps alone will pay for the tapper in a short time.

You save trouble because Viking Tappers take the trouble out of tapping.

For Precision Tool Room Tapping use the Viking Tapper. Capacity ¼" to ⅝".

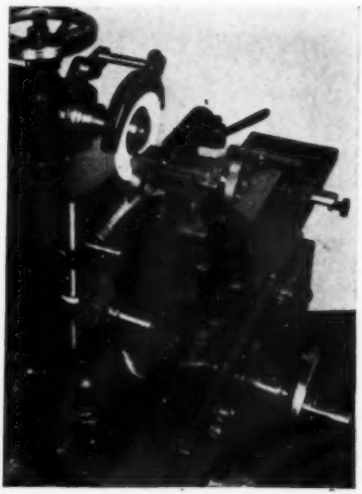
SEND FOR CIRCULAR

THE VIKING TOOL & MACHINE CORP.

14 MAIN St., BELLEVILLE, N. J.

No. 10 Formed Cutter Sharpening Attachment

A new Through-Feed Type Brown & Sharpe Attachment gives a straight cut across the entire tooth face, and provides for accurate sharpening of formed cutters with straight teeth. A



dish wheel is used, with the wheel spindle at right angles to the table; and the cutter is supported on a horizontal arbor between the centers of the machine as shown, and is passed across the face of the wheel by traversing the table.

The Attachment consists of a rigid, adjustable tooth rest assembly mounted at the top of a sturdy column which is adjustable vertically to accommodate cutters up to 6" in diameter. A rack and pinion provide easy, positive adjustment, and the rack serves as a key to maintain angular alignment, and is bolted to the machine table.

In operation, the tooth rest is located so as to touch the top of the cutter tooth close to the face being ground. The traverse adjustment of the Attachment on its base allows the tooth rest to be positioned for grinding the tooth

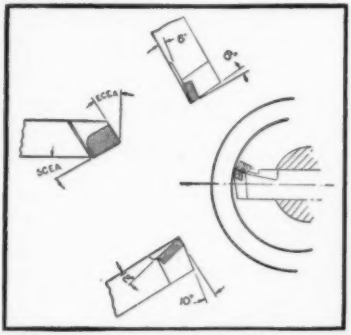
radial or with hook or drag, while at the same time keeping the tooth rest close to its supporting body for maximum rigidity.

A knurled nut at the upper front of the Attachment advances the tooth rest slightly in order to rotate the cutter toward the grinding wheel to remove more stock. Another nut, concentric with the first one, serves as a positive stop to determine the end of this movement, facilitating the grinding of duplicate cutters to uniform size.

A wheel spindle extension for the left-hand end of the grinding machine spindle is regularly included with each Attachment.

A New Boring Bit

A standard type of carbide-tipped boring bit that will give efficient service on most steel boring operations while requiring grinding alterations for special boring jobs, is announced by McKenna Metals Co., 135 Lloyd Ave., Latrobe, Pa.



The new boring bit has a 12° positive back rake as contrasted to the 2° negative back rake used on standard Kennametal-tipped turning tools. This 12° positive back rake, combined with a compound front clearance angle, provides firm support to the cutting edge while allowing ample clearance, as shown in the insert at right of cut. When used on average boring jobs, this tool will provide an effective back rake of —4° to +4°, depending upon diameter of bore.

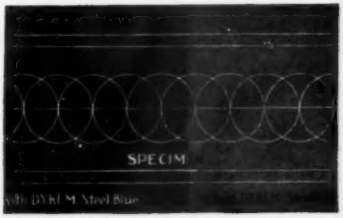
The front clearance angle on tip of tool is 0°, providing an effective cutting clearance of 4° to 10° for the average bore. The secondary clearance of 10° on the shank permits the tool to fit in holes without rubbing on the heel. On very small holes, heel of tool may be chamfered off to secure ample clearance.

While the back rake and clearances are standard for the new Kennametal boring bit, side cutting edge angles and end cutting edge angles vary for six standard styles in which the tool is supplied. The various combinations of edge cutting angles will be found effective for most boring jobs where bits are held in the boring bars from a 90° to a 45° angle—both for boring straight through and for cutting up to a 90° shoulder. The right and left hand tools for the six standard styles of boring bits are listed as Styles 23 to 34 inclusive. The tips on these tools are claimed to permit high cutting speeds on steel up to 550 Brinell hard, with close tolerances, greatly reduced tool wear, and an absence of "cratering" from steel chips.

DYKEM STEEL BLUE

STOPS LOSSES

making dies & templates



Simply brush on; ready for the layout in a few minutes. The dark blue background makes the layout lines show up in sharp relief, and at the same time prevents metal glare. Increases efficiency and accuracy. *Write for full information.*

THE DYKEM COMPANY

2301 G North 11th ST., ST LOUIS, MO.

(In Canada: 3194 Dundas St. West, Toronto, Ont.)

Stamp Your Small Work
SPEEDILY
and SAFELY

Up to 10,000 operations per hour are possible with this SPEEDY press. Hour-after-hour, day-after-day performance is easy, for this press has STAMINA. Operators are in less danger, because this press has SAFETY FEATURES ordinarily confined to the larger presses, such as: Automatic Knockout Bar; and Non-Repeat Clutch.

This small ROUSSELLE press has every feature that will increase production and profits.

Send for more information today.

DAVID J. ROSS CO.
BENTON HARBOR MICHIGAN

Tracing Cloth Catalog

An important change in their Tracing Cloth Catalog is announced by Arkwright Finishing Co., Turks Head Bldg., Providence, R. I.

The 1941 edition comes in a handy 6½ x 3-¼" size, a considerable reduction from the old 9 x 6 format. The new Catalog is expected to be much more convenient for draughtsmen and other users because it contains all the information necessary to pick out the proper type of tracing cloth.

Samples of the five Arkwright products—Arkwright Tracing Cloth, Prudence Tracing Cloth, Matsurf, Arkwright Pencil Tracing Cloth and Arkwright Pencil Cloth—have been inserted right in the Catalog so you can decide which kind of cloth is best for your particular work.

A.S.T.E. Names New Officers

Frank W. Curtis, Chief Engineer, Milling Machine Division, Van Norman Machine Co., Springfield, Mass., was elected President of the American Society of Tool Engineers at the annual meeting of the Board of Directors. Mr. Curtis, formerly Chairman of the Springfield Chapter of the A.S.T.E. succeeds A.H. d'Arcambal, Chief Metallurgist, Pratt and Whitney Co.

Elected 1st Vice-President was Otto W. Winter, Factory Manager, Columbus McKinnon Chain Corp., Tonawanda, N. Y. Mr. Winter, who is also National Chairman of the Society's Emergency Defense Training Committee, succeeds E. W. Dickett, Proposal Engineer, Sundstrand Machine Tool Co.

Ray H. Morris, Vice President, Hardinge Brothers, Hartford, Conn., was elected 2nd Vice President to succeed E. A. Rutzen, Ass't Works Manager, Evinrude Motor Co., Milwaukee.

Named Secretary was Clyde L. Hause, Sales Engineer, Gorham Tool Co., Detroit, succeeding Conrad O. Hersam, Consulting Engineer, Philadelphia, Pa.

Frank R. Crone, Chief Tool Designer, Lincoln Motor Co., Detroit, was re-elected Treasurer. Ford R. Lamb continues as Executive Secretary.

MOTORIZED MACHINES are Mechanized Forces

Mechanized forces that batter and conquer the enemy—mechanized forces that obliterate and overcome the forces of opposition such as lost time, wasted power, and meager production. That's what we offer in **Modern Motor Drives.**

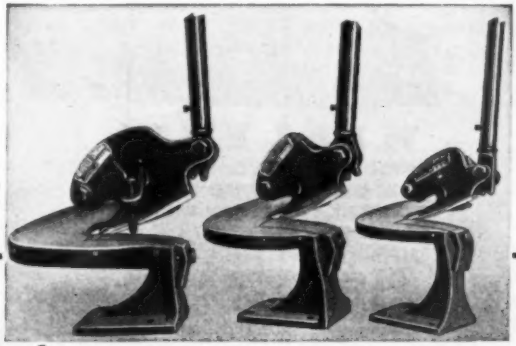
A mechanized toolroom is the first requisite for the defense of our nation. Then a mechanized army will be easy.

Production troubles are over when each machine is individually motorized with these modern, efficient, time saving, ball bearing equipped Motor Drives.

Write and receive full information regarding the motorization of each machine in your shop.

Quality Hardware & Machine Corporation
5833 RAVENSWOOD AVE., CHICAGO, ILL.

Cuts Intricate and Straight



Cuts Circular and Irregular

*NEW hold-down device for heavy duty BEVERLY Shear

Equipped with new ball-bearing hold-down device, the No. 3 heavy duty Shear is the finest money can buy! Cuts metal any shape without distortion! Stands up indefinitely on toughest jobs! Remember, you can —"Shear it cleverly on a BEVERLY"—

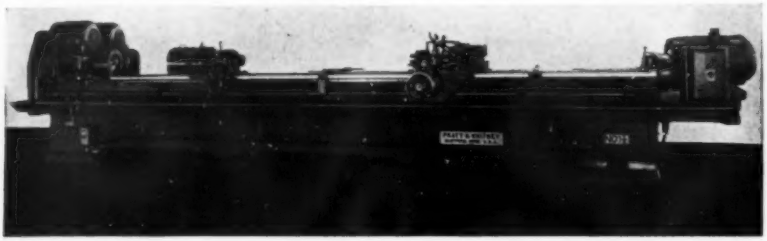
Write for prices now!

No. 1—cuts 14 gauge—wt. 16½ lbs.
No. 2—cuts 10 gauge—wt. 33 lbs.
*No. 3—cuts 3/16 inch—wt. 55 lbs.
(Equipped with ball bearing hold-down device)

BEVERLY SHEAR CO., 3005 W. 110th PLACE CHICAGO, ILLINOIS

No. 1½ Deep Hole Driller

The No. 1½ deep hole driller is offered by Pratt & Whitney for holes with a diameter ranging from 1″ to 2″. The four models offered have length capacities of 37″, 61″, 81″ (illustrated), and 105″. All machines have a swing over bed of 11″ diameter.



The No. 1½ is a production machine well suited for drilling gun barrels, connecting rods, hollow spindles, crank shafts, etc. It is of "twin" design for drilling two pieces simultaneously. Separate, independently operated motors, spindles, etc., make it possible for the operator to reload and start one spindle while the other is drilling.

The manufacturer emphasizes that producing long true holes is very different from ordinary drilling. The single flute, deep hole drill used remains stationary while the work revolves around it. Oil is led through the tube under high pressure, moving chips away from the cutting edge as fast as they form.

ON GUARD *against* *Production Loss*

with **PRODUCTIMETERS**

Electric Model 5-D1-MF (left) is ceaselessly on the job, giving *accurate count* for economical, efficient production control. It's ideal for counting small pieces, parts that must not be marred, articles too light in weight for mechanical contact. *Especially* adapted for use with Photo-electric Relays.

Full details in Catalog 16.
Send for your copy today!

There's a Productimeter for every industrial need. Write us for assistance on your counting problems.

DURANT MFG. COMPANY

1928 N. Buffum St. Milwaukee, Wis. • 180 Eddy Street Providence, R. I.

CENTERLESS GRINDING

19 years' experience with all types of work and materials.

Equipped to give you production grinding to total tolerance of .0001 in.

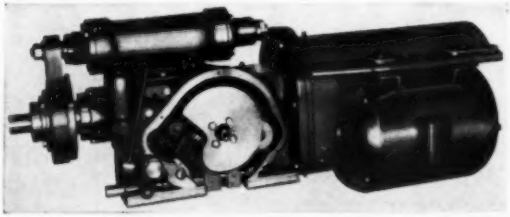
Inquiries Solicited—
Prompt Service

ERTEL MACHINE COMPANY

1420 East 20th St., Indianapolis, Ind.

POLISHING *HEAT TREATING*

"Empco" Unit Mechanisms



The Enterprise Machine Parts Corp., Detroit, announce acquisition of the Millholland patent rights and is now building these unit mechanisms and marketing them under the name "Empco." Notable improvements are said to have been made and efficiency has been stepped up.

The units lend themselves to a wide diversity of adaptations—for drilling, milling, tapping, reaming, and spotfacing (either singly or in multiples)—and are used to form machines for speedy production.

The units are designed especially for heavy work. To the specially designed cam is attributed the speed with which they perform. The cam, which utilizes the pneumatic counterbalance to best advantage, is claimed to have a chip cutting efficiency of 80% to 88%; which means that idle time has been reduced to a point that is practically negligible. Thus, added production is gained and more pieces can be produced in any given time.

The use of plate type cams, simple feed, and speed gears, plus the interchangeability of the same sized units and parts, permits change-over with minimum cost. Full automatic cycle with interlocked controls permits exceptional extensions of groups of units.

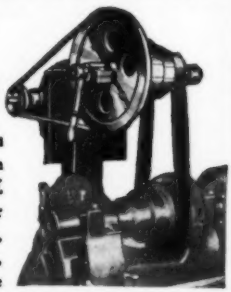
New Britain
UNIVERSAL VISE

Swivels 360 degrees horizontally, 100 degrees vertically, to give any angle or compound of angles.

Write for Further Information.

NEW BRITAIN TOOL & MFG. CO.
NEW BRITAIN, CONN., U. S. A.

GUARANTEED FOR 5 YEARS



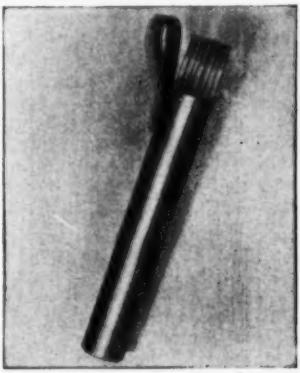
When you purchase a STEEGE Drive for your lathe, shaper, miller, etc., you're protected by our broad 5-year guarantee.

STEEGE Drives are easily installed—prices $35.00 up—sent on 30 days' approval. *Let us send catalog.*

W. L. STEEGE MACHINERY CO.
(Our 23rd Year)
548 W. Monroe St., Chicago, Ill.

Electrode Carrier

The increased tempo of industrial production has led to the introduction of an electrode carrier designed to save welders' time on the conveyor line, structural steel, bridge and ship work by providing an easy way of carrying extra electrodes.



The Jackson Electrode Carrier is made of high grade vulcanized black fiber, reinforced, and has a rod capacity of five pounds. (Also available in 10 pound capacity.) Its overall length is 12"; inside diameter, 1¾". The 5" belt loop is 1¼" wide, held in place by two brass rivets. Due to the hard usage given a container of this kind, the bottom has been made especially strong with ⅜" thick fiber, held in place by eight brass pins. Attached to the welder's belt, the carrier provides easy access to electrodes, swings out of the way of welding operations.

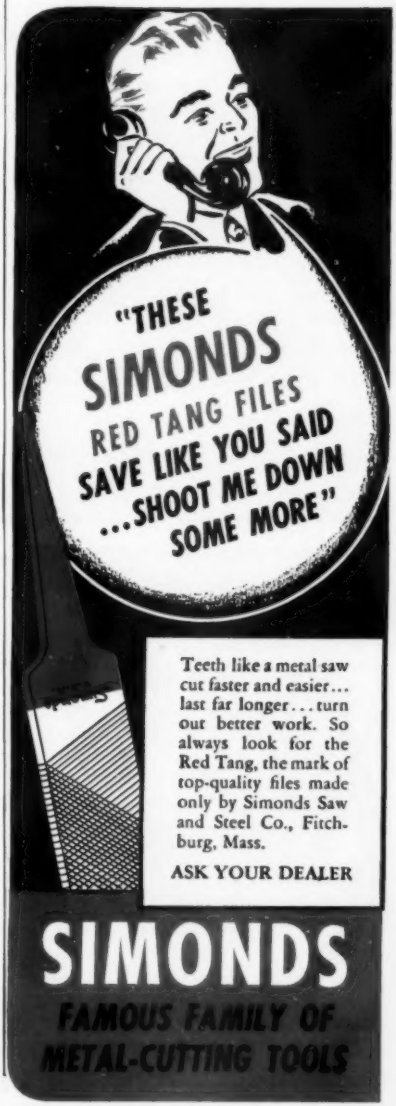
BURR KEYSEATERS

Mill keyways in the run or on the ends of shafting already erected—save money on alteration, erection, and repair work.

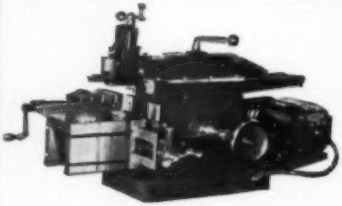
Made in 4 sizes, for hand or motor operation.

Write for Bulletins and prices.

JOHN T. BURR & SON
429 Kent Ave., Brooklyn, N. Y.


"THESE
SIMONDS
RED TANG FILES
SAVE LIKE YOU SAID
...SHOOT ME DOWN
SOME MORE"
Teeth like a metal saw cut faster and easier... last far longer... turn out better work. So always look for the Red Tang, the mark of top-quality files made only by Simonds Saw and Steel Co., Fitchburg, Mass.
ASK YOUR DEALER
SIMONDS
FAMOUS FAMILY OF METAL-CUTTING TOOLS

Hy-Duty Shape-Rite Shaper



8" Stroke Floor and Bench models with anti-friction bearings and helical gears throughout with balanced Bull Gear and Rocker Arm.

Sales Service & Mfg. Co.

3401 45th Avenue South Minneapolis, Minn.

for DRILL PRESSES AND MULTI-SPINDLE PRESSES

Precision

COLLET CHUCK

Drill sets to any distance. Grips on flutes as well as on shank. Faster speed.

Collet collapses 1/32". Small O. D.—Short Hangover. Thrust screw stop.

Triples life of drills, as it makes stub drills of Jobbers drills for shallow holes. Chuck Shank supplied for any type spindle.

Sizes, 1/2" dia. to No. 60 Drill.

Patents Pending

COLLET

Send for new Bulletin

ERICKSON STEEL CO.

80th & BESSEMER CLEVELAND, OHIO

Portable Coolant Pump

A small portable Gilman coolant pump has been developed which may be used on nearly every job where cooling and lubrication are necessary.

It has a 15 gallon capacity tank, which makes for ready portability and permits moving it from one machine to another and also moving to a place where it can be easily cleaned out and refilled. It has a rigidly built pump and is driven by a 1/3 h.p. ball bearing motor. A heavy electrically welded tank is used and the unit is mounted on three easy rolling, rubber-tired casters.

The pump output has a range of 10 to 15 gal. per minute, depending upon the head against which it must pump. It is equipped with a quick type hose connection which makes it very easy to change from one machine to another, and will handle either soluble oil or cutting oil efficiently. Larger pumps and tanks are available.

Oil Cup Wall Chart

A large chart is offered by Gits showing illustrations of many of the oiling devices included in their broad line. Twenty-four by thirty-six inches in size, this wall chart should prove useful to shop executives and others who are called on to specify oilers.

SPEED & PRECISION

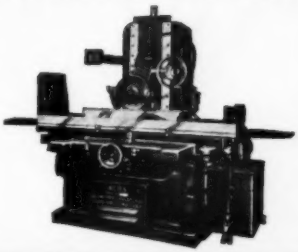
with

Grand Rapids Hydraulic Feed Surface Grinders

While keeping pace with the Defense Program Grand Rapids Grinders are maintaining the features that have made them one of the leading machine tools of the Nation.

One piece base and column insure accuracy at high speeds attainable on all Grand Rapids Grinders.

Write for Catalog GL-100



GALLMEYER & LIVINGSTON CO.

405 STRAIGHT AVE., S. W. • GRAND RAPIDS, MICHIGAN

SPOT DYER WELDERS

Floor Models 10—35 KVA
Bench Models 2½—10 KVA
220—440 Volts

MAXIMUM PRODUCTION
SIMPLICITY OF OPERATION
POWER ECONOMY

Standard and Underwriters Labeled Machines

Write TODAY For Literature

Only Manufacturers of the Dyer Welder

The Topeka Foundry and Iron Works Co.

INCORPORATED

300-322 Jackson Street Topeka, Kansas

QUALITY CUTTERS

The Standard of QUALITY

All standard sizes carried in stock for immediate delivery. Special cutters made to Blue Print.

As Cutter Specialists since 1919 we are able to offer the highest *quality* and *service* at *attractive prices.*

Write today for prices. *Few Territories Open.*

QUALITY TOOL WORKS
Market St., Waukegan, Illinois

BAUMBACH

STANDARDIZED
Machined Steel DIE SETS Semi-Steel
Drop Forged Steel

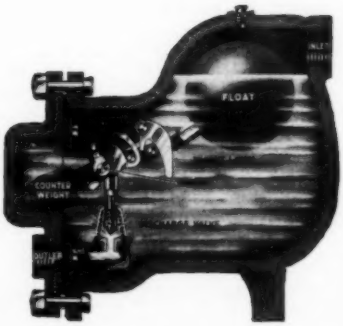
Headquarters for Standardized Die Sets, embodying many exclusive features and embracing more than 195,000 stock sizes and 46 different styles. A die service that is unsurpassed. Let us prove it!

Send for our new 336 Page Catalog.

E. A. BAUMBACH MFG. CO.
1810 So. Kilbourne Ave., CHICAGO, ILL.

Weight Operated Trap

A model "JR" Nicholson weight operated trap is announced by W. H. Nicholson & Co., Wilkes-Barre, Pa.

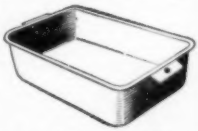


This device is especially designed for automatically draining water and oil from compressed air after-coolers, separators, receivers, etc.

It is available in one body size only, with either ½", ¾" or 1" screwed inlet and ½" screwed outlet connections. It is for air, gas, or saturated steam pressures up to 125 lbs. The "JR" features a welded stainless steel float and a water sealed discharge valve. The manufacturer emphasizes that this is not float-operated but is a float-actuated trap.

You Need A Tote Pan

Durable — Liquid tight — 5 gallon capacity — pressed from 1/16" sheet steel — 21-½"x13-¾" x 5-¾" inside.



Write for low prices today.

The Salem Tool Co.
SALEM, OHIO

FAST, ACCURATE GRINDING OF CONTOURS

Curved shapes in dies, punches, molds, cams, templates — finish ground without intricate set-ups.

This versatile Precision Tool grinds dies and punches to close tolerances after hardening.

WRITE FOR CIRCULAR AND FULL DESCRIPTION

BOYAR-SCHULTZ CORPORATION
2108 WALNUT STREET, CHICAGO, ILLINOIS

Anderson IMPROVED Balancing Ways

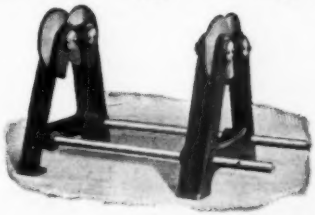
No Leveling Required

A profitable device for every shop handling rotating parts. It's simple, sturdy and dependable for balancing straightening and truing operations.

Four chilled iron discs rotate with minimum friction on sensitive special bearings, a prompt positive indication of either perfect or imperfect balance.

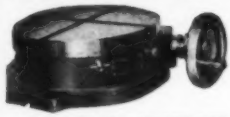
Write for attractive price and details.

ANDERSON BROS. MFG. CO.
1907 KISHWAUKEE ST., ROCKFORD, ILL.



Swing	Greatest Distance Between Standards	Capacity in lbs.
20 in.	20 in.	1,000
40 in.	30 in.	2,000
60 in.	30 in.	2,000
72 in.	66 in.	5,000
96 in.	88 in.	10,000

TROYKE ROTARY TABLES



Moderately Priced

Made in 9", 12", 15", 18", 21", 25".
With or without dividing attachment.
Ask your dealer or write us for new 1941 8 page catalog.

ALFRED A. TROYKE
4422 Appleton St., Oakley, Cincinnati, Ohio

"WESTLEN" *self-centering* REEL
FOR COIL STOCK

Coils are automatically centered by a few turns of adjustment wheel which eliminates tipping, back-lash and saves considerable time and trouble. Head is mounted on thrust ball bearings, giving smooth running action.

CLAMP TO HOLD STOCK
One-Piece Adjustable Clamp which holds stock in perfect position. Quickly adjusted when changing stock.

CROSS PIECE
Easily converted to vertical or horizontal position and adjusts height of reel.

ADJUSTMENT REEL
A few turns automatically adjust posts to suit diameter of the coil.

PRICED WITHIN REASON

RULETA COMPANY
26 S. Warren St., New York, N. Y.

Drill Grinder Bulletin

The new, improved line of Black Diamond Drill Grinders is the subject of a bulletin announced by the Black Diamond Saw & Machine Works, Inc., Natick, Mass. These grinders are claimed to be unusually effective in sharpening small wire gage and fractional drills, as well as for all ordinary drills. A web thinning attachment is available which is designed for accurately grinding the notched, Colton, or crankshaft point on drills.

Gear Chuck "Chuckgrams"

A series of "Chuckgrams" is being issued by the Garrison Machine Works, Inc., Dayton, Ohio. These illustrated leaflets describe many of the gear chucks manufactured by this company. They stress the convenience and accuracy possible when appropriate chucks are used for holding gears in turning, grinding and similar operations.

ACROMARK TRADEMARK *FAST*

MARKING & NUMBERING MACHINES HELP YOU DO A GOOD MARKING JOB.

Write for latest catalog.

CONSULT OUR MARKING SPECIALISTS ABOUT ANY MARKING PROBLEM.

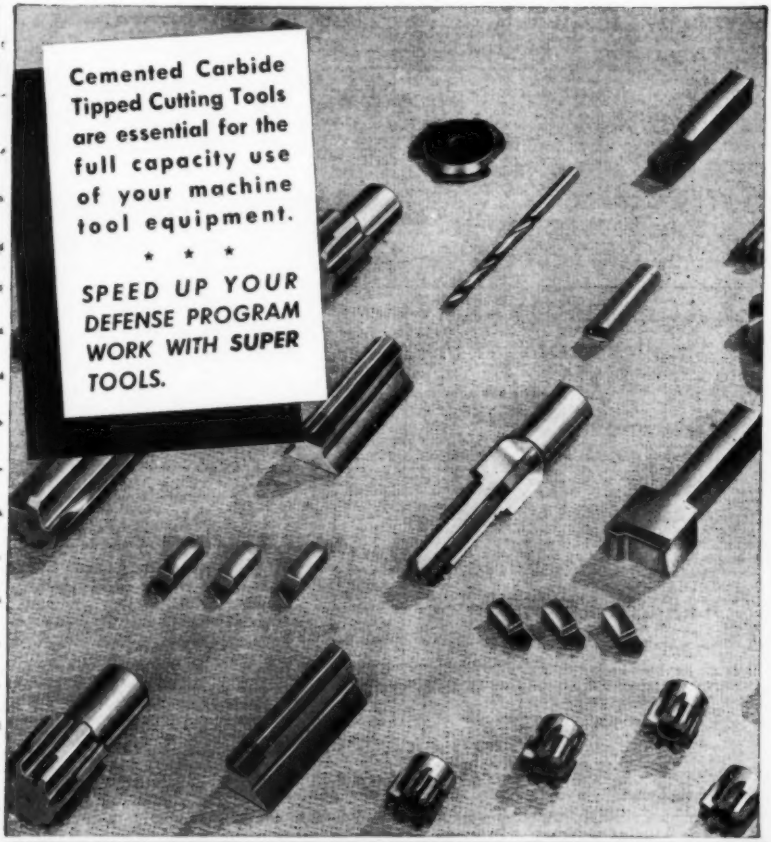
THE ACROMARK CORPORATION
250 No. Broad St.
Elizabeth, N. J.

HINGES

PROMPT DELIVERIES. ALL HINGES CAN BE FURNISHED WITH SPECIAL HOLES.

OPEN WIDTHS 7/8" TO 2". .035 TO .042. ANY LENGTH FROM 1" UP.

NATIONAL HINGE MFG. COMPANY
2650 W. 26th St., -:- CHICAGO, ILLINOIS


Cemented Carbide Tipped Cutting Tools are essential for the full capacity use of your machine tool equipment.
* * *
SPEED UP YOUR DEFENSE PROGRAM WORK WITH SUPER TOOLS.

SUPER TOOL CO.

21640 HOOVER RD. • DETROIT, MICH.

CARBIDE TIPPED TOOLS

FOR TURNING - FACING - REAMING - SPOTFACING - BROACHING
FORMING - GRINDER RESTS - WEAR PARTS - BORING - MILLING - DRILLING
GROOVING - COUNTERBORING - SHAVING - CENTERS - SPECIAL PURPOSES

LESLIE HAND PUNCH PRESS
MOST CAPACITY
POSITIVE ALIGNMENT

Takes punch press dies up to 3"x4½" in area. Has rated capacity of 2" hole in 14 gauge, (can punch 2" hole in 12 ga.). Leaf arm gives perfect alignment without leader pins. Portable. Price $75.00 F. O. B. Chicago. *Ask your dealer, or write for circular.*

LESLIE WELDING CO.
2947 Carroll Ave. Chicago

A COST CUTTER
on Small Precision Work

LINLEY
High Speed Vertical Milling Machine and Jig Borer

Pays for itself on die, jig and fixture work as well as molds for plastics, metal pattern work, laying out, drilling, milling and boring operations.

Fast and simple with correct speeds to insure safety to end mills. Ball bearing equipped; micrometer screw feed head.

Write for descriptive Bulletin B.

LINLEY BROTHERS CO.
11 Montauk St., Bridgeport, Conn.

Streamlined Vacuum-Pressure Unit

A new streamlined design of air pump is announced. Complete with a 1/12 h.p. motor, all parts necessary for vacuum or pressure operation are contained

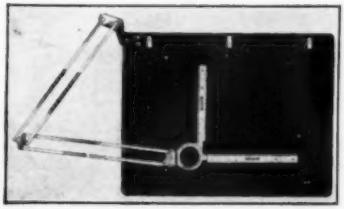
in the integral unit. Large enough to operate artists' air brushes, it may be had in black metal finish for industrial use as a machine accessory. The vacuum pump is of the rotary type, operating without gears, springs or valves, and is asserted to be unusually efficient, vibrationless and quiet in performance. A slight adjustment converts pump from vacuum to pressure service. Pump and motor measure only 8½" long by 4½" in diameter. Air capacity is 0.5 C.F.M. It is made by Gast Mfg. Corp., Hinkley St., Benton Harbor, Mich.

FlexoiD TOOL HOLDER
Universal Head
"It's all in the Tool"

No change in centers necessary when resetting cutter.
One Tool does it all.
All hard alloy steel.
Write for 30 day trial
THE SMITH POWER TRANSMISSION CO.
1545 E. 23rd St., Cleveland, O.

Portable Drafting Machines

A line of portable drawing machines, taking paper sizes from 9x12 to 18x24" is announced by The Drafto Co., 270 Walnut St., Cochranton, Pa. All models are mounted on Masonite board with parallel arms and protractor plate constructed of stainless steel.



Two small models, known as Nos. 10 and 15, which take paper sizes 9x12 and 10x15", feature scales made in one piece, permanently attached to the protractor plate. The protractor for these models is graduated in 2° intervals, and clamping device provides equal locking tension at all angles to prevent slippage.

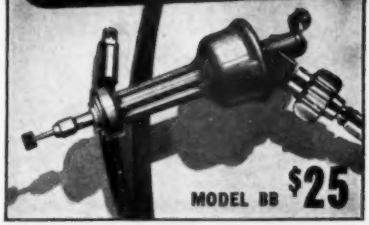
Two larger sizes, Nos. 30 and 35, have capacity for drawings to 12x18 and 18x 24". Protractor for these models is equipped with a vernier so that the machine can be set accurately to ½° readings. Also for speed and convenience, a latching device is provided which locks the scales at 0, 30, 45, 60 and 90° readings on either side of 0. Prices are said to be reasonable.

THE PRECISION UNIVERSAL TOOL HEAD

brings all adjustments under absolute micrometric control of the operator without stopping tool or machine. In Jig Borer, Milling Machine or Horizontal Boring Mill, it bores, faces, counterbores, turns outside diameters, mills flat surfaces and slots, under-cuts, recesses, back-faces and does an almost limitless range of "headache" jobs. Send for bulletins. Address all communications, inquiries and orders to

THE PRECISION TOOL COMPANY
P. O. BOX 155, BROOKLYN, NEW YORK
Cable Address: "Pretool-New York" Tel: MAin 4-1064

SPEED UP TOOL ROOM PRODUCTION



KIPP air GRINDERS
THE INDISPENSABLE TOOLS THAT CUT COSTS - SAVE TIME

This FREE trial offer permits any concern with a satisfactory credit rating to try out any Kipp Air Tool for ten days. Grinders sell from $9.75 to $58.75. Chippers and Filers at $19.75. The BB Grinder illustrated is only $25. Kipp Air Tools give you highest speeds, lowest prices and are proving indispensable in tool rooms and production departments. New catalog gives details.

FREE TEN DAY TRIAL
FREE CATALOG

☐ Send Kipp Air Grinder Model BB on your 10 day Free Trial Offer!

☐ Send the new Kipp Air Tool Catalog!

Name.....
Company.....
Address.....

MADISON-KIPP CORPORATION
207 WAUBESA ST., MADISON, WIS., U. S. A.

LITTELL Pres-Vac SAFETY FEEDER

KEEPS HANDS OUT OF DANGER ZONE

PRESSING trigger creates strong vacuum in cup for holding flat-surface materials for feeding to press. Releasing trigger releases piece held. Keeps hands out of danger zone. Single and double-cup types.

ASK FOR BULLETIN 9-C.

F. J. LITTELL MACHINE CO.
4153 RAVENSWOOD AVE. CHICAGO ILL.

SHEAR CUT - HIGH SPEED
END MILLS

Shear Cut End Mills are offered in all standard sizes, single and double end. Write today for catalog and prices.

Progressive Tool & Cutter Co.
2345 Wolcott St., Ferndale, Mich.

Floating Type Roll Brander

A new Cunningham tool is claimed to reduce the time of marking mill rolls to between 15 and 30 minutes where previous methods required 6 to 8 hours. Both the roll and roll holder are one-piece construction to eliminate possibility of thread or screw failures.

The unique floating type feature allows each piece of type to level itself in the roll. This results in clearer branding with every character the same depth. This same floating type feature is claimed to eliminate type breakage because pressure is always on the center line.

The type is engraved with a background clearance which eliminates chipping of the edges of characters when the branded roll is put in operation. No bearings are needed because of a special shaft design. The steel type is inserted and held in place by a new method which is said to eliminate the need for spacers and thereby reduces setting-up time.

Have you our Engineering Data Sheets on the new line of

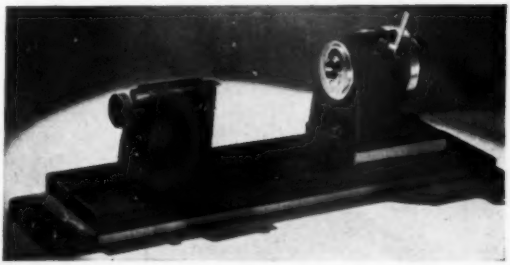
BABY GUSHER
Machine Tool Coolant Pumps?

Made in four types; 1/30 and 1/10 h. p. for small machine tools and machines requiring from 4 to 10 G. P. M.

Write for descriptive literature.

The Ruthman Machinery Co.
203 Pike St., Cincinnati, Ohio

Hardinge Collet Index Fixtures



Interchangeability is featured in the Hardinge Collet Index Fixtures just announced. Using the well-known HV-4 horizontal - vertical fixture as basis, a tailstock, sub-base, and horizontal index fixture were designed in relation to it.

These fixtures are for direct application or for use with the sub-base on milling machines, grinders, shapers, and drill presses. With the HV-4 and the T-4 tailstock a production mounting results which makes it unnecessary to make expensive special holding devices for each job. The HV-4 horizontal index fixture, tailstock, and sub-base illustrated provide a similar unit for tool room and inspection departments. Two tailstocks and sub-base form a centering device.

The manufacturer explains that these fixtures have many time-saving applications. They are used for milling keyways, punches, pinions, flutes in end mills, taps, counterbores, and cutting gear and sprocket teeth. A wide variety of punches can be ground with their aid. Also reamers, end mills, broaches, etc.

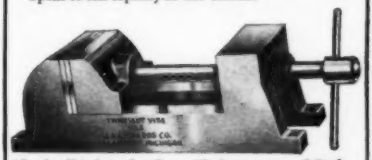
It is pointed out that the manufacture of duplicate parts requiring indexing is an excellent application of these fixtures.

How Abrasives Are Made

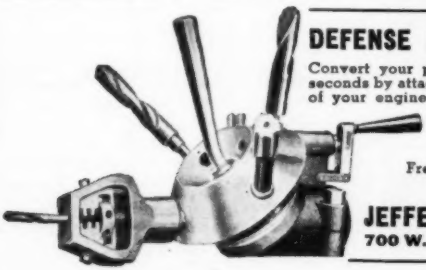
A lavish, illustrated brochure published by the Abrasive Co., Philadelphia, Pa., outlines all of the major steps in the manufacture of their grinding wheels and abrasive materials. With a page size almost 11" by 14", this handsome publication takes the reader step by step from the electric furnaces in Quebec province to the shipping room in Philadelphia.

DOUBLE YOUR DRILL PRESS CAPACITY

Minutes are Seconds with the new Twistight Vise. Opens to full capacity in one second.



J. A. Richards Co., Kalamazoo, Mich.



DEFENSE PRODUCTION SPEEDED UP

Convert your present lathe into a Turret Lathe in 15 seconds by attaching this Turret to the Tail-stock Spindle of your engine lathe. Five tools automatically center when brought into play. Three sizes.

IMMEDIATE DELIVERY

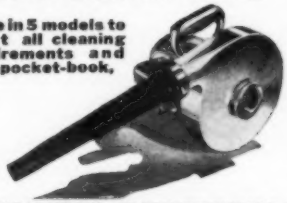
Free bulletins on our other time saving tools are awaiting your request.

JEFFERSON MACHINE TOOL CO.

700 W. FOURTH ST., CINCINNATI, O

YOU'LL BE MONEY AHEAD
When You Use A CLEMENTS
CADILLAC
PORTABLE ELECTRIC
BLOWER & SUCTION CLEANER

Made in 5 models to meet all cleaning requirements and your pocket-book, too.

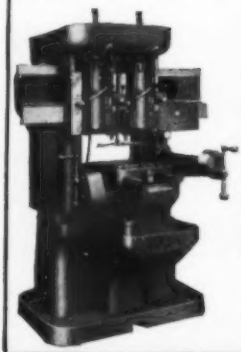


DIRT IS DANGEROUS AND DESTRUCTIVE AND A CLEMENTS-CADILLAC WILL ELIMINATE THIS CAUSE OF COSTLY DELAYS — EASILY, THOROUGHLY, ECONOMICALLY.

Write for Descriptive Literature.
ASK ABOUT OUR 10 DAYS FREE TRIAL

CLEMENTS MFG. CO.
6651 S. NARRAGANSETT AVE., CHICAGO, ILL.

MOREY No. 12M Vertical Profiler and Milling Machine



Low Cost Milling of Small Parts

Production of interchangeable parts requiring milling of any contour or outline can be materially speeded up by this Profiling and Milling Machine.

Ask for descriptive bulletin.

Morey Machinery Co., Inc.
410 Broome Street, New York, N. Y.

A Useful Drilling Jig

Speedy, accurate drilling of small parts is claimed for a drill jig offered by the Racine Screw Works, Racine, Wis. Accommodating any size drilling

operation up to ¼" diameter, the piece is placed in the jig and quickly locked into position by a turn of the handle. The handle, incidentally, may be reversed.

This drilling jig features a V block to center work which can be made in any form for holding special pieces. Four convenient adjustments provide quick change for length and diameter, for both shoulder work and gauging from the end. Chips fall away from gauging parts.

Carboloy Standard Tool Catalog

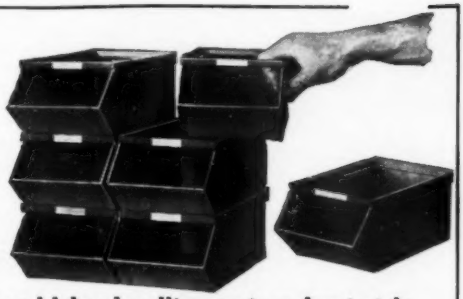
A new 8-page catalog (GT-129) covering its complete expanded standard tool line has just been released by Carboloy. The new catalog contains complete specifications and prices of all sizes of the low-priced standard tool line now available in 10 basic styles, and to be carried in stock in grades for machining steel and machining cast iron, non ferrous metals, etc.

Accompanying the tables are photographs of the tools together with dimensional drawings.

PARTS

where you want them---

when you want them



You'll save time, space and labor handling parts and materials when you use these patented STACKBINS. STACKBINS keep parts instantly accessible—eliminate waste hand motions—stack compactly to form units of exactly the right shape and capacity—make order filling or assembly work faster, easier, more efficient.

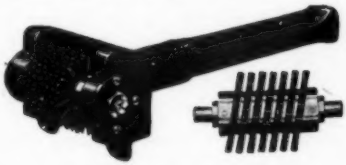
STACKBINS

"STACKED AND STILL ACCESSIBLE"

Write today for full story on patented STACKBINS, and learn new lessons in efficiency. Stackbin Corp., 55 Troy St., Providence, R. I.

GRINDING WHEEL DRESSERS—VISES

We manufacture the only complete line of Grinding Wheel Dressers and cutters and will gladly suggest the proper one for your wheels.



Desmond Heavy-Duty Dresser

The exclusive solid steel slide makes Simplex Vises stronger and more serviceable.

Simplex Machinists' Vise

Desmond Diamo-Carbo Dresser, best tool room dresser.

Write for catalog H showing complete line of Desmond Dressers and Simplex Vises and name of your nearest dealer.

DESMOND-STEPHAN MFG. CO., URBANA, OHIO

Canadian Desmond-Stephan Mfg. Co., Ltd.—Hamilton, Ont.

The CRITERION Carbide Tool Grinder

GREATER PRODUCTION CAPACITY

Provides positive rapid adjustment to meet the rigid requirements of production tool manufacturing. Built for continuous service. Adjustable coolant system. Large work tables instantly adjustable without wrenches or other tools. One-third H.P. balanced precision bearing motor completely enclosed and radially mounted in rubber. Standard equipment: One 60 and one 100 grit 7" dia. steel backed silicon carbide wheels. Ideal for metal bonded or Resinoid bonded diamond wheels.

Order from your dealer or write direct. Request literature. No obligation.

CRITERION MACHINE WORKS
BEVERLY HILLS, CALIFORNIA

Extruding Large Porcelain Parts

What is claimed to be the largest one-piece wet-process porcelain part ever made by extrusion and turning now is being manufactured on a production basis at the Derry (Pennsylvania), Westinghouse porcelain works. The part is a cylindrical form for a resonant choke coil, to be used on electric transmission lines. Outside diameter is 17-¼" and its length is 56-¼". Cut along the periphery of the form is a helical "screw thread", in which the coil is wound on the finished piece.

Secret of producing such a large piece by this method is said to be an improvement in the extrusion process. Instead of using a screw plug for producing the final blank, a rough blank is re-extruded in such a way as to remove the helical twist put in it by the initial extrusion. Differential shrinkage of clay, usually about 6% on large extruded parts, is said to have been reduced to 4% by this method. Hazard of loss of blanks in the dry stage also is about 25% less.

NIELSEN Heavy Duty Live Centers

Write for catalog on live centers

Adapted for heavy duty work. Precision type ball and roller bearings assure maximum capacity for high speed production and long service.

NIELSEN, INC. LAWTON, MICH.

Work Wanted

A NATIONALLY KNOWN MANUFACTURER OF PRECISION MACHINERY HAS FACILITIES FOR TAKING ON ADDITIONAL WORK for: W. & S. Turret Lathes, Boring Mills, Lathes, Punch Presses, Screw Machines, Precision Cylindrical and Internal Grinding, also Sub or Full Assembly Work.

BOX 142
c/o Hitchcock Publishing Co.
508 S. Dearborn St., Chicago, Ill.

PROMPT DELIVERIES — HONEST!

On JACKSON high speed vertical Milling and Boring Machines

This is a high speed precision production machine, capable of milling and boring pockets, slots, angles and compound angles up to 90 degrees without disturbing the work in the machine. Rigidly designed and constructed of quality materials to prevent operating vibration.

Column, knee, saddle and table are scraped in square to master plates. Spindle is constructed of special steel, heat treated and ground. V-belt direct drive with 5 speeds ranging from 200 to 3000 R.P.M.

Specifications, details and prices sent on request.

JACKSON MACHINE & TOOL COMPANY SALES DIVISION
JACKSON, MICHIGAN

NOW! The COLMONOY FURNACE WELDING PROCESS for Your Centerless Grinder Rests

This method consists of applying a casting of COLMONOY NO. 6 alloy to a steel base, by a furnace bonding process requiring no additional bonding material. One of the advantages of this process is its adaptability to high production parts, or intricate parts inaccessible for torch application.

COLMONOY NO. 6 is effecting substantial savings on machine tool parts subject to great wear and abrasion—lathe points, dogs, chip breakers, drill flutes, wire straightening shoes, thrust bearings, screw machine fingers, forming and drawing edges, etc.

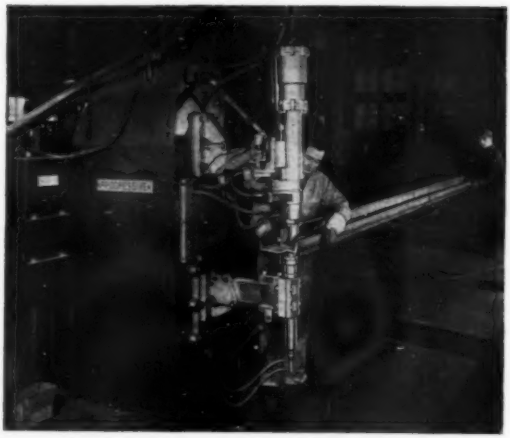
COLMONOY may be cast or applied as an overlay, using gas or electric welding equipment.

WRITE FOR CATALOG

COLMONOY
Hard Surfacing Alloys and Overlay Metals

WALL-COLMONOY CORP.
Sixth Floor, Buhl Bldg., Detroit, Mich.
NEW YORK 558 W. 54th St. TULSA 208 Midco Bldg. BUFFALO 3155 Seneca St.
WHITTIER, CALIF. 123 W. Philadelphia St. CHICAGO 625 W. Jackson Blvd.

Spot Welding Structural Steel Sections



Fabrication of up to 20 tons per day of structural steel with spot welding by means of the recently announced Resistance Forge Welding Process is said to show material savings in time. The Progressive pedestal type welder, now in use in a structural steel fabricating shop in Detroit, not only eliminates assembly punching and riveting, but also the necessity for specially skilled help since its operation is almost entirely automatic. Since approximately 80% of steel and iron fabrication for the average job is done entirely in the shop, the new process, which will soon be set up to handle a variety of work ranging from door frames to roof trusses, is expected to make many changes in the conventional methods of shop practice.

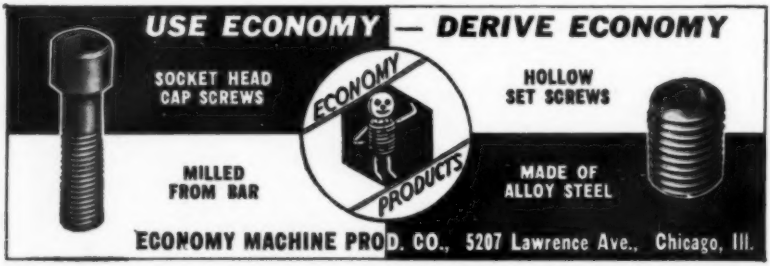
Equipment used for the operation consists of the self-contained, automatic, Resistance Forge Welder shown and is so designed that the operator merely feeds the work along and presses the foot operated pilot for each spot weld.

Under regular production operating conditions it is expected that conveyor feed will be used. For the present, the equipment is being used for such a variety of work that hand loading is employed. Fabrication of struts, for instance, is handled by the welder and one helper.

The entire strut assembly is 20 feet long, and consists of one 8″ channel section to which are welded two 4″ x 3″ x 3/8″ angles. The assembly is tack-welded to position the three parts and is then delivered to the welding station.

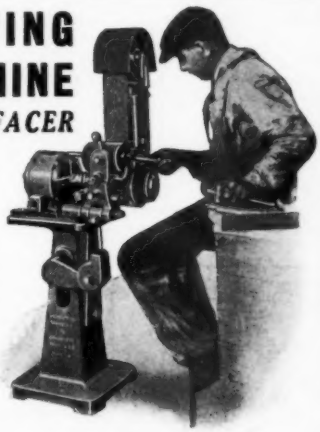
"Selector of Physical Properties"

Ampco Metal, Inc., Milwaukee, Wis., offers a cardboard slide selector by which the physical properties and



A BIG LABOR SAVING PRODUCTION MACHINE

TYPE S POLISHER & SURFACER



Combining a centerless feed polishing machine—a vertical or horizontal belt grinder—surfacer or polisher, and an internal grinder or polisher, the Type S is remarkably versatile. Suitable for metal, rubber, fibre, wood or anything that can be ground or polished, it has no equal for cylindrical polishing or straight line finishing on flat work. Can be changed for hand feed and from vertical to horizontal in few seconds. Cylindrical work ¼" to 1" in diameter may be fed automatically without centering or chucking.

Other Types—Also Reed High Speed Sensitive Drills.

Send TODAY for bulletin giving full details.

PRODUCTION MACHINE CO.
GREENFIELD. MASSACHUSETTS

A CLAMP for Every Purpose

Forged Steel
Quick Acting
Deep Reach
Welders

Sizes Available:
¾" to 10' opening
½" to 16" deep

Write for CATALOG and PRICES on Clamps for all purposes as well as many other tools for use in the Machine Shop.

IN STOCK AT YOUR SUPPLY HOUSE

The Cincinnati Tool Co., 1945 WAVERLY AVE., CINCINNATI, OHIO

Accurate Hole Transfer Made Easy With NIELSEN TRANSFER SCREWS

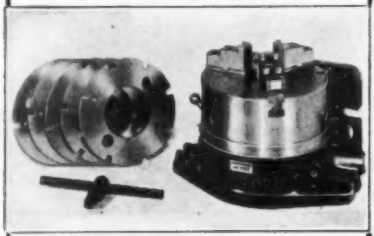
Simply insert in holes, invert, strike sharply and you have centers and drill circles perfectly located. Reduce time and eliminate spoilage of other methods. 7 sizes U.S.S.—Inexpensive—last for years.

Write for Circular

NIELSEN TOOL & DIE COMPANY
1859 Gardner Ave.
Berkley, Mich.

chemical composition of all grades of Ampco Metal may be ascertained quickly by manipulating the cardboard slide. The reverse of the selector contains a table listing the general uses of the alloy by grades. Thus, a prospective user with the problem of selecting a metal for a certain part can easily find the grades usually employed in the application and then, by setting the Selector, check to discover which grade most closely meets his requirements.

FOR MILLING, DRILLING, SLOTTING, OR PLANING



FOR ONE PIECE— —OR FOR THOUSANDS

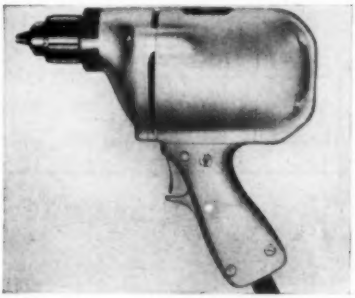
The HARTFORD "Super-Spacer" indexing fixture was designed to meet the demands of modern feeds and speeds. Its unequalled versatality fits it equally well for special work or for production jobs. Quick set-up—rapid, accurate indexing—elimination of error—greater rigidity—all these are yours in this new device.

Send today for complete information.

Hartford Special Machinery Co.
285 Homestead Ave., Hartford, Conn.

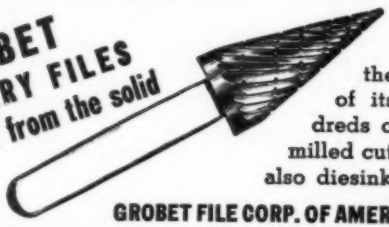
B. & D. Offer New Drill

Black & Decker announce, for the first time in their new 1941 Catalog, a new ¼" standard ball bearing drill.



It is described as a practical, popular-priced, production drill with high power, compactness, and light weight. It features anti - friction bearings throughout, splined gear mounting,

GROBET ROTARY FILES ground from the solid



Ask for Catalog WG

the most complete catalog of its kind, illustrating hundreds of rotary files hand cut, milled cut, ground from the solid; also diesinkers' burs.

GROBET FILE CORP. OF AMERICA 3 Park Pl., New York, N.Y.

locked inner and outer races on spindle bearing, and removable commutator end cover. With close offset and choice of end or side handle, this drill is particularly adapted to aircraft work, with a full range of spindle speeds to meet aircraft production requirements.

Drilling capacity in steel is ¼"; ½" in hardwood. The standard speed is 2000 r.p.m. and it is available, also, for speeds of 3500 and 5000 r.p.m.

Address the Black & Decker Mfg. Co., Towson, Md., for further details.

Marking Enameled Parts

A new method of marking enameled metals without engraving has been discovered by the Acromark Corp. It is claimed to reduce the marking time by at least ten to one and to give more attractive results.

Successful results were obtained with Roxalin metal coatings and the process consists of a steel die application to the coated metal under electrically controlled conditions and the mark of metal or color pigment results.

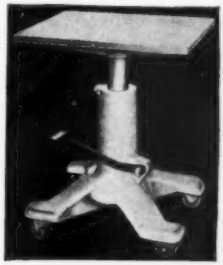
Binocular parts, enameled tubes, camera parts, instrument cases and a wide variety of enameled metal products can be trade-marked, numbered or otherwise marked by this new process and a special machine to simplify the marking procedure has also been developed.

First applications of the new process were on army binoculars and cameras for the British Government. It is thought that the method should reduce, very greatly, the cost and production time of numerous instruments and articles vital to defense.

CARROLL CLUTCHES

DISC TYPE "CP" for Countershaft Service. TYPE "CE" and "CEE" for Sleeve and Vee Belt Drives. Mechanism only can be procured by manufacturers incorporating Clutches into their own mounting for Vee Belt Drive. They have drag free idling at any speed. *Write Today.*

L.W. Carroll Mfg. Co.
2948 Ross Ave., (Norwood) Cincinnati, O.



SAVE Labor and Time

Eliminate heavy lifting. Cut handling costs. Table swivels and locks in any position. Can be varied 15½° by slight foot pressure, leaving operator's hands free. Engineered and built by tool engineers, experienced in production of special machines, dies, jigs and fixtures for exacting requirements.

Send TODAY for illustrated catalog No. 2.

MIDWEST TOOL & ENG. CO.
112 Webster St., Dayton, Ohio

5000 SHAPES AND SIZES GROBET Swiss Files

Ask for Catalog WF.

The most complete catalog of its kind. Lists 5000 different shapes, sizes and cuts of GROBET Precision Swiss Files. Ask also for catalog WM on files for filing machines.

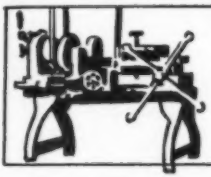
Learn more about these Chrome Steel Files that have won a reputation for utmost precision and durability.

GROBET FILE CORP. OF AMERICA 3 Park Pl., New York, N. Y.

Mechanics Through the Ages

ALTHOUGH THE REPEATING RIFLE WAS NOT INVENTED UNTIL 1867 CHINESE WARRIORS, CENTURIES, B.C. USED "RAPID-FIRE," REPEATING CROSS-BOWS, SHOOTING EITHER DARTS OR CLAY BALLS, FED FROM A MAGAZINE IDENTICAL IN PRINCIPAL WITH THAT OF THE MODERN RIFLE. EVEN TODAY, PEKING HOUSE HOLDERS USE THIS REPEATING CROSS-BOW TO GUARD AGAINST BURGLARS.

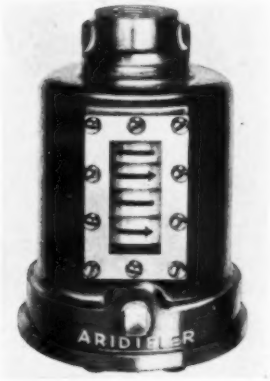
PRIMITIVE CHINESE BLACKSMITHS IN SOME SECTIONS STILL USE THIS CURIOUS WORK BENCH FOR FINISHING OFF METAL WORK! THEY SIT ASTRIDE IT, PUT THE WORK UNDER AN IRON STRAP—AND HOLD THE WORK IN PLACE WITH A CHAIN TIGHTENED BY FOOT PRESSURE. THEN THEY SET TO WORK WITH A LONG, HOME MADE FILE.



THE LUBRICANT FOR AMERICA'S OLDEST TURRET LATHE WAS KEPT IN A BARREL ON THE FLOOR ABOVE FROM WHICH IT TRICKLED DOWN BY GRAVITY THROUGH A PIPE TO THE MACHINE BELOW!

Looking Into Air Cleaner

To show prospective users just what happens inside a Logan Aridifier air cleaner and to prove that back-pressure is a negligible factor, the makers use a standard model with a window set in the housing wall.



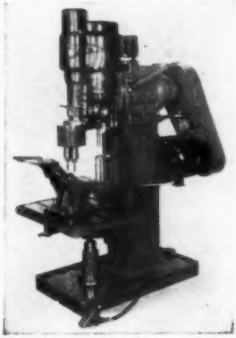
When installed in an air line it is possible to see each rotor pick up speed as air is applied to the line. An arrow painted on the edge of each rotor indicates the direction of rotation.

When the rotors are at operating speed, each rotor from the bottom up can be seen to discharge drops of water and oil and flecks of dirt as they are removed from the air stream and deposited in the dead air zone.

It is claimed these units will remove all condensed moisture, oil and fine scale from air and gas lines and that even under 24 hour per day continuous operation no maintenance is required as rotors are balanced on grease-packed bearings and there are no parts to wear, clog or become inoperative. Units need no attention other than periodic drawing off of accumulated water and dirt from the traps.

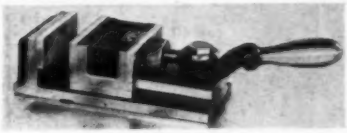
Automatic Nut Tapper

A new Kaufman No. 10-A Hi-Duty Tapping Machine with Hi-lo gearing, equipped with a two spindle head and semi-automatic magazine fixture is announced. In its operation, nuts are fed to the magazines by hand, and are located beneath the taps and ejected



automatically; 12 speeds are provided in geometric progression. This tapper can also be equipped with a revolving index type fixture or any other type normally used in this class of work.

MILLING MACHINE OR DRILL PRESS VISES AT LOW COST



IMMEDIATE SHIPMENT

High Grade Precision Made

No. 24 Cam Action, 4" Jaw, wt. 20 lbs., $20.00 net — No. 34 Screw Action with base, 4" Jaw, wt. 36 lbs., $24.00 net.

Prices F. O. B. NEW HAVEN

PROUT MACHINE COMPANY
50 Prout St., New Haven, Conn.

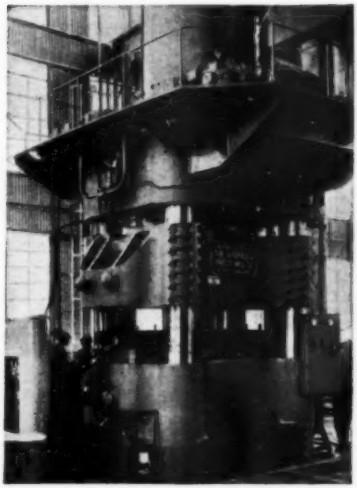
Dealer Inquiries Solicited

Giant Press for Britain

A pad of rubber weighing two tons, manufactured by The B. F. Goodrich Co., has been installed on a 5,000 ton press built by Hydraulic Press Co., for a British aircraft factory.

The press pad, one of the largest ever produced and will soon be in service stamping out parts for the Royal Air Force.

The picture shows workmen installing the rubber in the giant press, one of the largest ever manufactured.



The pad of 4,000 pounds of rubber shown here is 14′, 2″ long, 4′ 3″ wide and 10-⅞″ thick. The rubber is used in a new method of fabricating parts for airplanes.

GS TOOL CHESTS

GS TOOL CHESTS are designed for the safe-keeping of valuable precision tools and the convenience of machinists and toolmakers. Write for bulletin showing various types and sizes available. Quick deliveries

Geo. Scherr Co.
122 Lafayette St.
New York, N. Y.

CLIMB CUTTING

Possible with Hydraulic Power Feed on the Armor

Milling Machine. Reduces cutter mortality 20%.

Countless Table Speeds available—at finger tips.

Write for bulletin 4B

Aircraft Machinery Corp.
Burbank, California

New Wheelco Catalog

A new catalog is announced by the Wheelco Instruments Co., 1929-33 S. Halsted St., Chicago, Ill.

The Wheelco line includes a variety of temperature control instruments. Remote controllers, pyrometers, portable potentiometers, and "Flame-otrols" are a few of the items described.

Rotary Files

These files are available in a number of different styles and sizes, in either High Carbon Steel or High Speed Steel.

Send for catalog showing a wide variety of standard shapes and special shapes. Perhaps we have what you want in stock, if not, we can grind it.

The Rotary File Co.

Hand Cut

If you have need for special shape Files, we shall be glad to submit the desired File for your approval and trial upon receipt of a sample or sketch.

This service is designed especially for your convenience, for which we make no charge.

STRATFORD, CONNECTICUT

HORIZONTAL

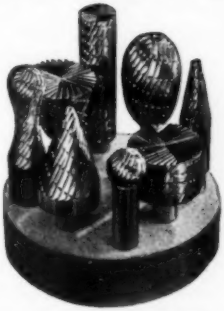
SEND FOR OUR NEW CATALOG

QUALITY **Strand** SERVICE

FLEXIBLE SHAFT MACHINES

OVER SIXTY TYPES AND SIZES—1/8 TO 3 H. P.

ROTARY FILES



ROTARY CUTTERS

VERTICAL

N. A. STRAND & COMPANY

CHICAGO

5001 - 5009 NO. WOLCOTT AVE.

Economical Live Ball and Roller Bearing Centers are going to play an important part in our National Defense Program.

FOR LATHES, HAND SCREW MACHINES, GRINDERS and MILLS

The features that interest you most:

1. Simplicity, sturdiness, and heavy duty.
2. 50% more radial load carrying capacity than the average live center.
3. Large spindle, small head, short overhang, most desirable for rigidity and to be free from chatter.
4. With the aid of cap screw you can lock spindle to redress point right in your machine.
5. Special oil seal to retain lubricant and keep out foreign matter.
6. A compression pad to compensate for heating and expansion of metal as a safety factor, with reasonable diligence exercised.

A folder giving prices and complete detail will be mailed to you upon request.
A ten day trial. If not perfectly satisfied your money will be cheerfully refunded.

MOTOR TOOL MANUFACTURING CO., 12282 TURNER AVE. DETROIT, MICHIGAN

Standard Since 1911

L&J

INCLINABLE POWER PRESSES

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successors to Lochbouch-Jordan Tool & Machine Co.

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TAKE THE DUST OUT OF INDUSTRY

Save Time, Labor and Maintenance Expense

with the

TORNADO

Portable Industrial Vacuum Cleaner

Powerful— 46¼" waterlift

Portable— Weight 40 lbs.

Capacity— 12 gallons

Sturdy— Built to last

Attachments for every purpose

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LIVE CENTERS

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AUTOMATICALLY COMPENSATED FOR

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ARE ACCURATE, DURABLE

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STURDIMATIC TOOL COMPANY

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Classified Section

USED AND REBUILT MACHINERY

Lists of Used and Rebuilt Machinery, either For Sale, Wanted, or For Exchange, set in uniform style, will be published in the Classified Section at the rate of $5.00 for your name and address and a five line advertisement. For additional lines, 40c per line.

Write directly to those offering the machine for sale, **for prices and full descriptions. If what you seek is not advertised, write Hitchcock Publishing Company, Chicago, making known your wants on either new or used machinery and the publisher will gladly pass them along to the advertisers.**

FOR SALE BY
Aaron Machinery Co.,
176 Lafayette St., New York, N. Y.

Borer, Rockford 3" horizontal.
Die sinker, Jackson No. 4, s.p.d.
Drills, radial, 3' Morris, 36", 4' Muelier, m.d.
Drills, Allen, 2, 4, & 6 spindle.
Eyeletting machines, United Shoe, Model B.
Gear hobbers, G. & E. and Shuchardt & Schutte, b.c.
Grinders Brown & Sharpe No. 1, 2, 3 universal.
Grinders, No. 55, 60, 65, Heald internal.
Grinder, No. 70 Heald Internal.
Grinder, No. 51 Greenfield, Internal.
Grinder, Abrasive No. 33, m.d.
Lathe, Hendey 24x8', 9 speed, geared head.
Lathe, Pond 39x21'.
Lathe, 18-36"x7'-10' Fay Scott, sliding bed gap.
Lathes, 14x6' Hendey (5), cone and grd. head.
21" Gisholt, 3¼" hollow spindle.
Hardons & Oliver No. 2, 4.
Steinle 24" Universal, 64", h.s ,m.d.
Pratt & Whitney 2½x26" grd. head, s.p.d.
Miller, Cincinnati No. 4 plain.
Miller, Cleveland No. 1 plain, s.p.d.
Miller, Milwaukee No. 2½B vertical, s.p.d.
Millers, B. & S., Cincinnati No. 2, 3.
Millers, Brown & Sharpe No. 12 production.
Miller, Cincinnati No. 3 Universal.
Power Presses, Bliss, V &O. No. 18, 20, 1, 2, 3, 4.
Screw machines, automatic B.&S. No. 00, OG.
Shaper, Ohio 16", s.p.d.
Turret lathes, Warner & Swasey No. 4, 6.

Factory & Mill Supply Co., Inc.
176 Federal St., - Boston, Mass.

Boring mill, 76" Bullard vert., 2 swivel hds., m.d.
Planer 48"x48"x12' Betts, 3 heads, m.d.

Sheet Metal Specialty Co.
Follansbee, W. Va.

Surplus Tools for Sale

Strip feed press, No. 820 Bliss, complete with 8 sets change gears, motor driven. This press was used only two months and is for sale because we have discontinued this item.
Four slide, No. 2 - 18 Baird, with press attachment & motor drive. This machine was never used.

FOR SALE BY
Lloyd Machinery Inc.
150 Broadway New York, N. Y.

Boring mill, 42" Gisholt, 2 heads, m.d.
Gear generator, 11" Gleason, auto. bevel, s.p.d.
Gear generator, 10" Gleason, spiral bevel, m.d.
Gear hobbers, No. 12 Barber-Colman, single overarm s. d. (4).
Grinder, 84" Diamond, wheel diam. 30", m.d.
Lathes, turret No. 4 Millholland 2-1/32" p.f.b.d. (2).
Lathe, turret 18" Libby Model A.
Miller, No. 5 Hendey, Lincoln type, b.d.
Planer, 60"x60"x10' Cincinnati, dbl. std., 3 hds., m.d.
Slotter, 24" Newton, table diam. 42", m.d.

S. M. Regar Machinery and Mill Supplies
Tampa, - - - - Florida

Hammer, Lingle 50 lb. power, arranged m. d.
Hammer, Little Giant 50 lb. power.
Lathe, LeBlond 17" rapid production q. c. feeds.
Lathe, Bement Miles, l. c. g., 36" factory raising blocks, 44"x22" bed.
Lathe, Gisholt, 24", hole in spindle 6".
Lathes, National 18" production, 1¾ cone, (2).
Saw, cold, Higley m. d. No. 27-36", takes blade 30".
Slotter, Bement Miles 16", circular table.

Pittsburgh DuBois Company
DuBois, Pennsylvania

PRESSES

Toledo press, No. 90 E dbl. crank, tie rod, stroke 3", Dayton, Rogers air cushions, price complete, $1,900.
Toledo press, No. 91 C double crank, straight side, stroke 2", price complete, $1,200.
Toledo press, No. 93 dble. cr., str. side, stroke 3", m. d. Dayton Rogers air cushions, price complete, $2,500.
Prices F.O.B. DuBois, Pennsylvania.

AUTOMATIC SCREW MACHINES

No. 56 Acme, 2¾" capacity Model A 4 spindle automatics, (2), price, $4,500 each.
No. 55 Acme, 1-5/8" capacity, Model A 4 spindle, automatics, (2), price, $4,000. each.
No. 53 Acme, 1" capacity, Model A 4 spindle automatics, m. d., (2), price. $3,000 each.
Prices F.O.B. DuBois, Penna.

Prices include a large quantity of collets, tools, and die heads.
The above machines are now operating and can be inspected at our factory.

USED AND REBUILT MACHINERY

FOR SALE BY

D. E. Dony Machinery Co.
47 Laurelton Rd., - Rochester, N. Y.

Dieing machine, 25 ton H. & W.
Gear bobber, No. 1 Adams.
Grinder, 14" P.&W., vert., b.b., with p. fd. rot. table.
Lathe, 20"x10' Davis.

Jones Machine Tool Company
Front & Pike Sts., Cincinnati, Ohio

LATHES

14"x6' Bradford, q.c.,c.d.
14"x6' Carroll-J ,q.c.,c.d.
14"x8' Willard, q. c.,c. d.
18"x10' Mueller, q.c.,c.d.
20"x10' Hamilton, q. c., c. d.
18"x10' Monarch, q. c.,
3-S., d. b. g.
22"x12' Amer.,q. c., c. d.
30"x16' Amer., i. c., c. d.
26"x12' Bridge'd, q.c.,c.d.
32"x14' Amer., i. c., c. d.
28"x14' Boye & E., c. d.

MILLERS & SHAPERS

No. 3 Brown & S. univ.
No. 2 Cleve. pl., s. p. d.
No. 3-A Owen plain, c. d.
No. 7-H Becker Lincoln type.
No. 13 B. & S. pro miller.
20" Steptoe, b. g., c. d.
20" S. & M., b. g., c. d.
16" Whipp plain, c. d.
14" G. & E. hi. duty, c. d.
24"x6' Ohio planer, 1 hd.

MISCELLANEOUS

8'—14 ga. Robinson sq. shear.
10'x3/16" Dreis & Krump square shear.
3'x½" Niagara shear.
No. 16 26" Blanchard vert. grinder, 25 h. p., m. d.
12x36 Modern cyl. grind., m. d.
12x36 Landis cyl. grinder, b. d.
5' Foodick radial, s. p. d.,
6' Foodick radial, s. p. d.
1¼" Acme bolt cutters.
6" Williams pipe thread.

FOR SALE BY

The Ainge Tool & Engineering
Springfield, Ohio

No. 1 Cleveland horizontal boring mill, dia. spindle 2½", single pulley drive, $3000.00.

Capitol Machinery Exchange
401 Broadway, - New York, N. Y.

Lathes, 16"x8' Prentice, g.h., m.d., Bridgeport auto. threading, g. h. s.p.d, also Sidney, LeBlond, Rahn-Larmon, g.h., m.d., 20"x10'.
Millers, No. 1 Kempsmith univ., m.d., div. heads, ver. att., Osterlein plain, Miller, No. 5C Becker ver. c.d.
Turret lathes, Acme 2½", 1½", 1" Milholland 1¼", No. 6 Warner & S. No. 9 Bardons & Oliver, Foster 1¼".
Other machinery in stock.

The Reeve-Fritts Company
28 N. Clinton St., Chicago

Boring machine, Barrett horiz., 3½" bar.
Drill, radial No. 3 Barnes, horiz. duplex.
Drill head, U. S. 4 spdl., 1½" cap.
Grinder, Gisholt universal tool.
Hammer, 100 lb. Little Giant upright.
Saw, cold No. 15 Lee-Simplex, 5½" cap.
Saw, cutoff, 18" Porter.
Screw mach., 3" P &W., A.C.&W.F., (2).
Tapper, No. 1 Garvin vertical, ¼" cap.
Turret lathe, 19" P. & W., geared head.

West Penn Machinery Company
1210 House Building, Pittsburgh, Pa.

Air compressors, 30 to 2500 cubic feet.
Air compr. portable gas I-R 180 cu. ft.
Bending roll, 8'x¾" Cleveland, m. d.
Blower, No. 4 Roots, capacity 2110 c. f. m.
Bolt cutters, 1½" & 3" Acme, b. d.
Boiler, 48 h.p. Titusville 110 lb. pressure.
Boring mill, 34" Colburn, turret hd., b. d.
Brake, 8'—12 ga. D & K, hand.
Bulldozers, Nos. 3, 4, 6, 9, 28, & 30.
Crane, 4 ton Shepard, 21'5" span, 440/3/60.
Crusher, jaw, No. 4 Champion, b. d.
Die filer, No. 3 Thiel, m. d.
Die sinker, No. 2 P&W., b. d.
Drill sharpener, Ing.-Rand "Leyner", 1¼".
Drill, radial, 4' Fosdick, speed-box, s.p.d.
Drill, radial, 5' American, semi-univ., b.d.
Drill, radial 6 Reed-Prentice, single pulley drive.
Drills, upright 10" to 36".
Drill, No. 216 Baker, No. 5 M, T., b.d.
Engine, gas, 20 horse power Bessemer.
Gear cutters, 11", 18" & 24" Gleason.
Gear tester, bevel 18" Gleason.
Grinder, "Kwick-Way" universal purpose, m.d.
Grinder, drill, No. 21 Oliver, 1½", m. d., 220/3/60.
Grinder, internal, No. 60 Heald, b.d.
Grinder, knife 18' Bridgeport, m.d.
Grinder, roll, Farrel 30"x76"
Grinder, surface vertical, 30" table, 16" wheel, m.d.
Grinder, surface, No. 1 Diam. 14x24, mag. chuck, m. d.
Grinder, surface rotary, 8" Heald, b. d.
Grinders, D. E. 2—3 & 5 h. p., 220/3/60.
Hammers, 50 lb., 75 lb., 100 lb., 200 lb. Upright.
Hammers, Nos. 2-B, 3-B, 4B, 6-B, Nazel.
Hammers, steam, forging & drop.
Keyseater, No. 1 Davis, 1"x8", m.d.
Keyseater, No. 1 Baker 1½"x12", b.d.
Lathe, bench, 11"x4' South Bend, m. d.
Lathes, speed, 11" and 13" Blount, m. d.
Lathe, brass 18x6", friction head, power feed, b. d.
Lathe, 14"x6' American, t. a., b. d.
Lathe, 16"x12' Hendey, grd. head, t. a.
Lathe, 20"x10' Springfield, t. a., m.d.
Lathe, 20"x12' Monarch, q.c.g., d.b.g., b.d.
Lathe, 26"x18" Pittburgh, d b.g., t.a., b.d.
Lathe, 42"x16' Schumacher Boye, q. c. g., belt drive.
Lathe, Lo-Swing 8"x60", s. p. d.
Lathe, roll, 42"x20' United, m.d.
Lathes, turret, Nos. 1, 2 and 3 W. & S., b. d.
Locomotive, gas, 6 ton Milwaukee, 36".
Miller, shapei, duplex, No. 14 Cochrane-Bly, m.d.
Miller, Lincoln No. 32 Kempsmith, b.d.
Millers, plain, No. 13 & No. 13½ Garvin, b. d.
Miller, universal, No. 4 Garvin, b. d.
Miller, vertical, Burke, table, 16x6, b.d.
Mixers, Sprout-Waldron, batch & liquid.
Nibbler, No. 1 Campbell 3/16", 6" gap, m. d.
Pipe mchs., 2", 4", 6", 8" & 12" Landis-Oster-Williams.
Planer, 24"x24"x6' Gray, 1 head, b.d.
Planer, 39"x36"x12" Cincinnati, 2 hds., b.d.
Press, forging, 150 ton United, steam hyd.
Presses, OBI, No. 19 Bliss & No. 4 Niagara, 2" str
Press, No. 55 Toledo, bed 20x19.
Press, screw, No. 87 Niagara, hand power.
Press, arch, No. 30 Bliss, roll feed, b.d.
Press, strip feed, No. 31-C McDonald, b.d.
Pumps, centrifugal 6", 4", 1", motor drive.
Punch, EF Cleveland, 36" throat, 1½" thru 1".
Punch, multiple, 32 W & W, 10' 2"
Punch, horiz. No. 7 Kling, m. d., 220/3/60.
Riveters, air, hammer, spinning.
Rolling mill, cold 9"x18" motor drive.
Saws, friction, Nos. 2, 3 & 4 Ryerson motor drive.
Saw, cold, 48" Newton motor drive.
Saw, metal band, Laidlaw, m.d.
Shapers, 16", 20", 24" & 36" Gould & Eberhardt.
Shears, alligator, 1½", 2", 3", 4" & 6".
Shear, Angle 6x6x1 Long & Allstatter, m. d.
Shear, Niagara 42"x14 ga., belt drive.
Shear, Stoll 60"x3/16", motor drive.
Shear, 84"x1" H. & J. 36" gap, m.d.
Shear, plate, 96"x1¼" Morgan, 22" gap.
Shear, guill, No. 2 H. & J., 24" rd. b. d.
Shear, guill, 4'x4" Newbold, b.d.
Straightener, 12'x¾" Shuster, b. d.
Straightener, 12'x1" Shuster, b. d.
Straightener, 60" McKay, 17 rolls 4½", m. d.
Straightener, 84"x1" Bertch, m.d
Straightener, No. O Medart, 1½", m.d.
Testing machine, 400,000 lb. Riehle, b. d.
Tumbling barrel, 34"x45", belt drive.
Upsetters, 1" to 6".
Welder, spot, 13 K. V. A.

USED AND REBUILT MACHINERY

FOR SALE BY

Lang Machinery Company **28th St. & A. V. R. R.** **Pittsburgh, Pa.**

Air compressors, Ingersoll-Rand XB-2, 600, 888, 1200 & 1500 cu. ft. 100 lb. pressure, motor drive.
Air comp. 14"x12" Ing. Rand "ER-1", 464 c. f., m. d.
Bolt cutter, 1" Landis, 14"-3" sgl. hd., b. d.
Bolt cutters, 1" Acme, Landis hds., 2 & 3 spdl.
Bolt cutter, 2" Acme, Landis head, b. g., b. d.
Boring mill, 30" Bullard, threading attach., s. p. d.
Boring mill, 36" Bullard rapid prod., s. p. d.
Boring mill, 42" Bullard, 2 swivel heads, b. d.
Boring mill, 60" Niles, 2 heads, b. d.
Boring mill, 72" Colburn, 2 heads, r. p. t., m. d.
Boring mill, 72" Pond, 2 heads, b. d.
Boring mill, horiz. 2½" bar N-B-P, knee type, b. d.
Boring mill, horiz. 3½" bar D & H, floor type.
Boring mill, horiz. 5" bar Barrett, b.d.
Boring mill, horiz. duplex B. & S., 5" bars, m. d.
Boring mill, horiz. 6½" bar Niles, floor type.
Drill, mult. 8-spindle, Fox, b. d.
Drill pointer, Sellers, m. d.
Drill, radial, 3' Bickford, t. a., b. d.
Drill, radial, 3½' Prentice, t. a., b. d.
Drill, radial, 4' Bickford, t. a., m. d.
Drill, radial, 4' Morris, t. a., m. d.
Drill, radial, 4' Fosdick, t. a., b. d.
Drill, radial, 6' Cincinnati-Bickford, t.a., m.d.
Drills, upright, 14" to 32", belt drive & m.d.
Drills, upright, 36" Aurora and Snyder, p. f., b. d.
Drills, No. 1 Avey, Sens., m. d., (2).
Dividing head, 20" diameter.
Gear cutter, 49"x12" Gould & Eberhardt, s. p. d.
Gear cutter, spur, 30"x16", B. & E., m. d.
Gear cutter, spur, 84" Newark, m. d.
Gear planers, 24", 37" and 54" Gleason, bevel, m. d.
Grinder, disc, 18" Diamond, dbl. end.
Grinder, dbl. end, 8" U. S. Elec. 220/3/60/3450 r. p. m.
Grinder, dbl. end, 12" Marschke, 2 H. P. 220 v. D. C.
Grinder, dbl. end, Standard Elec. 7½ H. P. 220 v. d. c.
Grinder, gear tooth, Detroit No. D-12, m. d.
Grinder, internal cylinder, No. 5 Landis, b. d.
Grinder, piston, No. 2 Van Norman, b. d.
Grinder, plain cyl., 12"x96" Landis, b. d.
Grinder, surface, No. 16 Blanchard, m. d.
Grinder, univ., No. 5 B. & S., 20"x72", b. d.
Grinder, No. 60 Heald, b. d.
Hammer, 30-lb. Bradley, upright strap.
Hammer, power, 300-lb. Bradley, upright helve.
Hammer, power, No. 4 Beaudry, b. d.
Hammer, board drop 800 lb. Chambersburg, b. d.
Hammers, steam drop, 400-lb. to 8000-lbs
Hammers, steam forging, 800 lbs.—6000 lbs.
Keyseaters, Mitts & Merrill No. 5—3½", m. d.
Keyseater, No. 3½ Baker, 3½", m. d.
Lathe, 9"x4' bench, So. Bend, m. d.
Lathe, 10"x5' Seneca Falls, p. c. g. b. d.
Lathe, 14"x8' Rockford, semi-q. c. g., d. b. g., b. d.
Lathe, 15"x10' Lebastian, p. c. g., t. a., g., b. d.
Lathe, 15"—24"x8' Sebastian grd. head, m. d.
Lathe, 16"x6' Cincinnati, q. c. g., d. b. g., t. a., b. d.
Lathe, 16"x8' Pratt-Whitney, p. c. g., b. d.
Lathe, 16"x10' Bradford, grd. head, q. c. g., m. d.
Lathe, 17"x6' LeBlond, automobile, b. d.
Lathe, 18"x6' American, q. c. g., d. b. g., t. a., b. d.
Lathe, 18"x6' Prentice, p. c. g., t. a., b. d.
Lathe, 18"x8' Prentice turning, d. b. g., p. c. g., b. d.
Lathe, 19"x10' Hendey, q. c. g., b. d.
Lathe, 18"x8' Rockford, semi-q. c. g., d. b. g., b. d.
Lathe, 20"x10' Hamilton g. d. head, q. c. g., s. p. d.
Lathes, 26"x11' Wickes hvy. duty comb. Eng. & Tur.
Lathe, 27"x11' LeBlond, grd. hd., q. c. g., d. b. g., m. d.
Lathe, 27"x12' Putnam, hvy. duty, q. c. g., d. b. g., b. d.
Lathe, 32"x14' S. & B. hvy. duty, d. b. g., q. c. g., b. d.
Lathe, 32"x16' Schumacher & Boye, p. c. g., d. b. g., b. d.
Lathe, 36"x18' American, p. c. g., t. a., b. d.
Lathe, 36"x26' 6" New Haven, p. c. g., b. d.
Lathe, 36"x45' N-B-P turning, grd. head, m. d.
Lathe, 40"x16' Fifield, trip. grd., int. face plate d., b.d.
Lathe, 42"x20' Springfield trip. grd., p. c. g. b. d.
Lathe, 46"x17' 7" Pond, triple grd., p. c. g., b. d.
Lathe, 48"x26' Johnson, trip. grd., int. face pl. dr., b.d.
Lathe, 60"x20' Niles, b. g., b. d.
Lathe, gun boring, 2 bar, cap. hole 12"x40', m. d.
Lathe, turret, 14" Garvin, h. s., 1¼", p.f., b. d.
Lathe, turret, 16" Warner-Swasey, h.s. 1 7/16", b.d.
Lathe, turret, 18" Reed, h.s., 1½", p. f., b. d.
Lathe, turret, 24"x24" Jones & Lamson, h.s. 2½", s.p.d.
Leveller, 84" Bertsch 7 rolls, m. d.
Leveller, plate, 48" McKay, 17-roll, m. d.
Miller, duplex, 36"x33"x10' Ingersoll, m. d.
Miller, hand, Reed, table 7"x12", b. d.
Miller, hand, No. 3 Rockford, table, 18"x4½".
Miller, plain, No. 0 Steptoe, table 26¾"x8¾", b. d.
Miller, plain, No. 24 Brainard, b. d.
Miller, plain, No. 2-A Milw. tbl. 48"x12", s. p. d.
Miller, plain, No. 5-C Becker-B., tbl. 60"x16", b. d.
Miller, slab, 30"x24"x12' Ingersoll, adj. rail, m.d.
Miller, rotary, Ingersoll 60", m. d.
Miller, Vert. Taylor & Fenn, tbl. 20¾"x6", m. d.
Miller, vertical Niles, table 42" dia. b. d.
Vertical attach., for No. 5 grd. hd. Cincinnati miller.
Pipe machines, Landis ½" to 2", belt drive, (2).
Pipe machines, No. 308-B Oster, m.d.
Pipe machines, 8" Williams, 2½" to 8" motor drive.
Planer, 24"x18"x4' New Haven, 1 head, b. d.
Planer, 24"x24"x8' Lodge-Davis, 1 head, b. d.
Planer, 30"x30"x8' Cincinnati, 2 heads, m.d.
Planer, 36"x36"x11' Sellers, 2 heads, b. d.
Planer, 48"x48"x30' Putnam, 3 heads, m. d.
Planer, 54"x54"x20' Pond, m. d.
Press, arbor, No. 24 Greenerd.
Press, double acting, No. 1 Bliss, roller feed,
Press, dbl. crank, 79-D, Stoll 72"x26", m. d.
Press, dbl. crk., No. 95 Bliss, stroke 3½", m. d.
Press, foot lever, No. 87 Bliss stroke 1½".
Press, hydraulic 150 ton Chambersburg, m. d.
Press, hydraulic, 100 ton, Watson-Stilman, m. d.
Press, forging, hydr. 500 ton Farrell-Birmingham, m.d.
Press, hydraulic, forging, 1000 ton Morgan.
Press, o. b. i. No. 3 Adriance, stroke 2½",
Press, o. b. i. No. 68-C Bliss, stroke 8".
Press, perforating, No. 5 V & O, str. ¾", dbl. crk., b.d.
Press, straightening, Hunt hydraulic, 50 tons.
Press, trimming, No. 58½ Toledo, m. d.
Press, trimming, No. 76½ Bliss, m. d.
Press, wheel, 300 ton Chambersburg, m.d.
Profiler, Nos. E3, Keller, motor drive.
Punch, lever, No. 58 Niagara, 36" throat.
Punch & shear, comb. No. 10½ Badger, ½" thru ¾".
Punch & shear, Cleveland EF, arch jaw, thrts. 36", 1¼" thru 1", m. d.
Saw, band Type JM Laidlaw, cap. 6", m. d.
Saw, band 26" Crescent, tilting tbl 20"x24", b. d.
Saws, hack, 4"x4", 6"x6", 9"x9", 12"x12", b. d. & m. d.
Screw machine, ¾" Cleveland, Model "B", m. d.
Screw machine, Pratt & Whitney, cap. 1", b. d.
Screw machine, Model "A" Cleveland, 4¼".
Shaper, 14" Hendey friction, b. d.
Shaper, 16" Steptoe, b. g., b. d.
Shaper, 24" Hamilton, heavy duty, b. g., b, d.
Shaper, 24" Stockbridge, gear box, m. d.
Shaper, 25" Steptoe, b. g., b. d.
Shear, allig. Pittsburgh, cap. 2"-2½", m. d.
Shear, allig. No. 7 United, 6" square, m. d.
Shear, alligator, No. 61 Carlin, 3" round high knife.
Shear, bar, Mesta 36"x14", m. d.
Shear, circle, No. 05 Niagara, b. d.
Shear, flying, Edwards, capacity 10 sq. in.
Slotters, 8" Betts, table 20" dia., m. d. (2).
Slotter, 18" Bement, table 36" b. d.
Straight'ner, strip, & cut. No. 1 Schuster, 2½"x¼", m.d.
Straight'ner, shape, No. 3 Sutton, 2-way, cap. 2½", m.d.
Tapper, No. 2 Garvin, ½"-4", b. d.
Welders, 150 amps, 200 and 300 amps, portable.

USED AND REBUILT MACHINERY

FOR SALE BY

Wiener Machinery Co.
237 Centre St., - New York City

Automatics, No. 2G B&S m.d., ser. nos. over 5000, (2).
Gear cutter, No. 36B G&E., spur, bevel & worm, m.d.
99 per cent new.
Lathes, 14" and 16" Hendey, belt drive.
Milling machines, No. 2 Cincinnati, plain, (3).

Galbreath Machinery Co.
306 Empire Bldg., Pittsburgh, Pa.

Boring mill, vertical, 14'x30', 2 heads, m.d.
Bulldozer, No. 4 Williams-White, m.d.
Hammer, 1500 lbs., N.B.P., single frame.
Punch & Shear, No. 5 H. & J., 48" tht., s.e.
Rolls, bending, 49'x1", pyramid, d.e., m.d.
Partial list. Send inquiries.

Alex Zeeve
2282 Woolworth Bldg., New York, N. Y.

Boring mill, horizontal, 7" bar.
Boring mill, 34" Rogers, vertical, s.p.d.
Drills, radial, 4' Dreses, 3' American, g. b.d.
Gear hobbers, 24" Rhenania; 18" Schuchardt-Schutte.
Hammers, Power, 400, 300, 75 lb. Beaudry "Champ.".
Keyseaters, No. 3 Mitts-Merrill, No. 2 Baker.
Lathes, 52"x34' Nicholson-Waterman, geared faceplate drive, 29"x16' Walcott, qcg., ta., 24"x 16' Whitcomb-Blaisdell, qcg., taper, 24'x11' Lehmann, 16 speed g. h., m.d., taper, 20"x10' L.&S. qcg., dbg., 16"x6' Kimball-Walcott, 12 spd. g.h., spd., 14"x8' Hendey geared head, spd., others.
Miller, No. 2A Milwaukee, plain, dble, overarm, spd.
Planers, 36"x36"x10' Pond, 4 hds., 24"x24"x6' Pond.
Shaper, 20" Steptoe, heavy duty, b.g., cone.
Shear, 8'x3/4" Lennox, rotary splitting, m.d.
PLATE WORKING SPECIALS
Flanger, 9" McCabe, pneumatic, lot of dies.
Roll, pyramid, 10'x8" Hilles & Jones, drop-end, m.d.

Joseph Hyman & Sons,
Tioga and Almond Sts., Philadelphia, Pa.

WORLD'S LARGEST STOCK
POWER PRESSES

Marquette 4 point suspension press, tie rod, 8" stroke.
Bed 72" R to L x 64½ F. to B. pneumatic air cushion in bed, weight 73,000 lbs.
No. 65 K Niagara, gap, grd., double crank, 72".
No. S 206 Ferracute, dbl. crank 126", crank 7½"—9". (2)
No. 105 Consolidated gap, d.c.
No. 106 Bliss gap, double crank, geared.
Nos. 93B, 91C, 90D, Toledo double crank presses.
No. 76½ Bliss, geared, straight side.
No. 58½ Bliss-Consolidated, geared.
Nos. 74½, Bliss geared, straight side.
No. 1½ Bliss, toggle press.
No. 164½ Toledo, toggle press, tie rod.
No. 164½ Toledo toggle press.
Nos. PA3 Ferracute & 13 Toledo horning. (3)
No. 25½ Bliss-Consol. horning.
No. 662 Toledo, 250 ton knuckle joint, coining.
75 ton EG51 & E51 Ferracute.
400 ton Perkins, coining.
250 ton & 150 ton Waterbury Farrel, coining.
No. 23 Bliss, 250 ton, knuckle joint.
150 ton EG52 Ferracute, knuckle joint.
Squaring shears, various sizes.
These and hundreds of others of popular makes and sizes, are in stock at our warehouse here.
Rebuilt and Guaranteed.

FOR SALE BY

O. T. Webb Machinery Co.
743 N. 4th St., - Milwaukee, Wis.

Lathe, 15"x6' Cin. Champion, q. c. g., cone drive $300
Lathe, 15"x6' Cin. Champion, semi q. c. g., cone dr. 200
Lathe, 16x6 Flather, loose change gear, t. a. 150
Lathe, 22"x10' Porter, loose change gear, 2½" hole 450
Shaper, 14" Steptoe, crank, plain cone drive..... 290

The Nutmeg State Machinery Corp.
1041-1051 State St., New Haven, Conn.

Boring mill, Espen Lucas No. 26, 4" bar with ex. table.
Grinders, Bryant No. 30, chucking, 35" swing, motor driven by 3 motors, (3).
Grinder, Persons Arter 8" rot. sur. with tank & pump.
Grinder, Brown & Sharpe No. 2 universal.
Grinder, Cincinnati, 12"x36" universal.
Miller, Cin. No. 2 univ. high power, s.p.d. with hds.
Turret lathe, Acme 3¼"x36", geared head.

E. L. Klauber Machinery Co.
3221 Olive St. - - St. Louis, Mo.

Lathe, 14"x7' Hamilton, s.q.c.g. taper attchmt., collts.
Lathe, 14"x8' Fay & Scott, q.c.g. gap bed, draw bar.
Lathe, 18"x16' Rahn, Carpenter, Mayer.
Lathe, 20"x8' American, gd. h., turret on carriage.
Miller, No. OY Brown & Sharpe plain.
Press, No. 69N Bliss o.b.i., double action, roll feed.
Radial, 2½' Carlton, high speed, belt.
Shapers, 16"-20' Ohio, 20" Cincinnati.
Testing machine, Rockwell, No. 5 H-40.
Threading machine, Landis, 2" single head.
Turret lathes, No. 1 Wood tilted, No. 3 Bardons & O.

Foster Machinery Co.
3982 Bluestone Rd. Cleveland, O.

Buffer, 3 h.p. 3400 r.p.m., 220 volt.
Bulldozer, Williams & White No. 4, double end.
Bulldozer, Williams & White, No. 23.
Compressor, tank & 3 h.p. motor unit.
Drill, Footburt, 2" in steel.
Forging roll, No. O.C. Ajax.
Grinder, 10"x30" Landis (universal).
Punch, horizontal Cleveland, Style "T" motor drive.
Punch, Long & Alstatter, 36" throat, 1½" cap. arch jaw.
Saw, 6" Newton, cold.
Saw sharpener, 11S Cochrane & Bly.
Welder, ½" butt.

Davis Machinery Company
1-3-5 St. Clair St. Toledo, Ohio

Gear cutter, 48"x12" Gould & Eberhardt, s.p.d.
Gear cutter, No. 3-36 Brown & Sharpe, s.p.d.
Gear hobber, No. 1 Farwell automatic, cone dr.
Grinder, No. 3 Brown & Sharpe uni., belt dr.
Grinder, No. 14 Brown & Sharpe, b.d.
Grinder, No. 2 Diamond surface, b.d.
Grinder, No. 24-A Gardner, 53" horz. disc, m.d.
Grinder, No. 6 Gardner, 26", dbl. end disc, b.d.
Grinder, No. 2 Norton tool & cutter, belt dr.
Lathe, 16"x8' Monarch, q.c.g., cone dr.
Lathe, 19"x8' LeBlond, hy. duty, q.c.g., c.p
Mill, No. 3 Cincinnati, hi power, rect. overarm.
Mill, No. 2-B Milwaukee, dbl. overarm.
Mill, No. 3 Kempsmith plain, c.p.
Mill, No. 3 LeBlond plain, c.p.
Mill, No. 4 Cincinnati plain, c.p.
Shaper, 20" Columbia, crank, back gd., c.p.
Shaper, 16" Cincinnati, crank, b. g. for m. d.

USED AND REBUILT MACHINERY

FOR SALE BY

E. M. Newland

1600 So. Phoenix, Tulsa, Okla.

One 24" Steinle turret lathe in very good condition.

New Products Corporation

North Shore Dr., Benton Harbor, Mich.

One new Besley No. 372-53" vertical spindle dry grinder with 53" disc.

Russell Machine Co.

438 Oliver Bldg. Pittsburgh, Pa.

Bend, roll H&J 10'x3/8" D.E., m.d.
Boring mill, 42" Bullard, 2 swivel heads, s.p.d.
Boring mill, horiz, 5½" bar Niles, floor type.
Boring mill, horiz. 3-3/8" bar D&H, floor type.
Boring mill, horiz. 5" bar Barrett, b.d.
Gear cutter, 36" Brown & Sharpe.
Gear cutter, spur, 84" Newark, m.d.
Gear planers, bevel, 54" Gleason m.d., (2).
Hammer, 300 lb. Bradley, upright strap.
Hammer, 1500 lb. Bliss board drop.
Lathe, 46"x17'6" Pond, p.c.g., triple grd., b.d.
Press, hyd. wheel, 300 ton Chambersburg, m.d.
Press, dbl. crank, 79-D Stoll, 3" str., m.d.
Shaper, 24" Hamilton heavy duty, b.g., b.d.
Shear, Alligator, No. 61 Carlin high knife, 2½" sq.
Slotter, 18" Bem. Miles, table 36" dia., b.d.
Straightener, No. 1 Shuster flat strip metal, m. d.
Upsetting machines, 2½, 3½, 4 and 5" Ajax iron bed.

Wm. C. Johnson & Sons Machy. Co.

1211 Hadley St., St. Louis, Mo.

Air compressors, 15 in stock.
Bolt threaders, 1", 1½" & 2" Acme.
Boring mills, 6'—8', 44" Niles.
Boring mill, King 34", turret head.
Broach, 3A La Pointe of Hudson.
Drill, Natco 13 spindle, No. 1 taper.
Drill, No. 2 Fox, 6 spindles.
Drill, Moline hole hog, 5-sp. No. 4 Morse taper.
Drill, radial, 4' Fosdick; 3½' Mueller, 3' Reed-Prentice.
Drill, radial, 3' Cincinnati Bickford.
Drills, radial, Drillmaster, new.
Gearhobber, No. 3 Adams.
Grinders, 10"x30" and 6"x18" Landis.
Hammers, 300 lb. Beaudry, 75 lb. Bradley, 50 & 100 lb. Little Giant.
Lathe 15"x6' LeBlond, quick change g., taper attach.
Lathes, 16"x6' Greaves Klusman, q. c. g.
Lathe, 13"x10' South Bend, quick change gear.
Lathe, 20"x10' Cisco, g. h., t. a., like new.
Lathe, 24"x14' Lehman, quick change gear.
Lathe, 32"x14' Schumacher & Boye.
Miller, Cin. production type, 57"x11" table.
Miller, No. 1½ American.
Miller, No. 2 Le Blond plain.
Miller, No. 3 Cincinnati plain.
Miller, No. 2M Rockford universal.
Miller, 2½ Rockford universal.
Pipe machines, 2"—4"—6"—8"—12".
Pipe machine, 2" Landis.
Planer, 30"x30"x14' Cincinnati.
Press, 92B Toledo double crank.
Presses, Nos. 2, 3 & 4 Marshalltown.
Presses, 3, hydraulic pump & accumulator.
Roll, plate straightening, H. & J. No. 2, like new.
Shapers, 12"—16"—20"—24".
Punches, shears, bulldozers.
Testing machine, 100,000 lb. Riehle.
Toggle press, 407 A Bliss.
Large stock guaranteed electric motors. Any size.

FOR SALE BY

B B Machinery & Tool Company

503 Locust Street Trafficway, Kansas City, Missouri.

Drill, radial 4½' Dreses.
Gear cutter, Gleason bevel.
Lathes and planers.
Miller, No. 3 LeBlond universal
Shapers, 16", 20" and 24".

Reliance Machinery Sales Company

1407 Brighton Place, N.S. Pittsburgh, Pa.

Air compressors, 139 and 450 cu. ft.
Brake, press, 6'x16 ga. Robinson.
Grinder, Bath 12x32" univ.
Hammer, 300 lb. Bradley, upright helve.
Hammers, 50 lb. Mayer upright, m. d.
Keyseater, No. 2 Baker.
Lathe, 27"x15' Reed-Prentice, arr. m.d.
Lathe, 18"x8' L.&S. pat. head, d.c., m.d.
Miller, 30"x10' Newton planer type.
Presses, No. 1 Toledo, O.B.I.
Press, No. 21 Bliss, 2" stroke.
Press, No. 21½ Bliss, blanking, m.d.
Press, horning, No. 40 Bliss.
Press, No. 82-C Toledo dbl. crank, 5" shaft, 44" wide.
Roller leveller, 54", 17—4½" rolls, m. d.
Shear, alligator, No. 1½ Canton, cap. 2" sq., hi-knife, like new.
Slotter, 15" Bement, crank, 36" rot. table.
What do you need? What have you for sale?

Failor-Strafer Machinery Co.

132 Liberty St., - - New York, N. Y.

Automatic, 3½" Gridley, single spindle.
Boring mill, 72" Rogers, 2 heads.
Boring mill, 42" Bullard vert., 2 hds. 3 jaw table.
Drills, 3' American sensitive radial.
Drills, 30" Reed Prentice, upright m.d.
Gas furnace, 2 compartment, 16"x14".
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Grinder, 24" Cincinnati Face Mill.
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Lathe, 42"x24' Davis, m.d.
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Lathe, 32"x12' Putnam, 3 step cone, d.b.g., hvy. duty.
Lathe, 32"x11' American, triple geared, hvy. duty.
Lathe, 30"x14' Davis, cone drive.
Lathe, 26"x10' Bridgeford, 3 step cone, taper attach.
Lathe, 26"x10' Walcott, 3 step cone, d. b. g., hvy. duty.
Lathe, 26"—48"x18' McCabe, two spindle.
Lathe, 24"x26' Greaves & Klusman, taper attach.
Lathe, 24"x14' American 3 step cone, d.b.g., hvy. duty.
Lathe, 24"x12' Porter, cone drive.
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Lathe, turret 1" cap. Biggs hand screw mach., p. fd.
Miller, No. 2 Shields, high power, single pulley.
Miller, Ingersoll 36"x6"x16', adj. rail, 3 heads.
Nibbler, Gray, 3/16" cap., 30" throat.
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Planer, Cincinnati, 56"x42"x8', 3 heads.
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Presses, 4 No. 3 Bliss Consolidated, inclinable.
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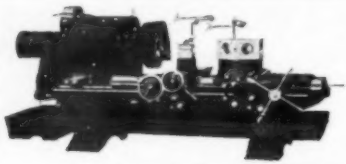

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No. 6 Besley Dble. Disc
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No. 63 Michigan, S.S.
Canco, No. 5, 8' stroke, S.S., B.G., m.d. & m.
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DG-53 Ferr. S.S., S.C., B.G., G.M.D.
No. 6C Rockford dble. cr., s.s.

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6' 10 ga. Bertsch
No. 862 Niagara, 62" 3/16" cap., 15" gap

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1" National, Steel Bed
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16"x6' Hendey, Q.C.G., m.d.
32"x14' Hendey quick change, m.d. & m.
18" Cinc. Acme, b.g. (3)
3x36 J & L Flat Turret, s.p.d.
14"x5' Walcott
20"x8' Lehmann
2¼"Jones & Lamson Screw Mch.
16"x12' Lodge & Shipley, q.c.g, t.a.
28"x10' Chard, heavy duty, t.a.
60"x10' New Haven, back geared

Mills
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Nos. 1, 2 & 3 Craftsman Prod., Rotary
54" Ingersoll Rotary, 3 head, m.d.
66" Newton Rotary, m.d.
No. 1 Kempsmith Universal (2)
No. 1½ Cincinnati Plain, c/s.
No. 4 Brown & Sharpe, cone drive
84" Sellers Vert. Boring
Taylor-Win., Fed., Thomson Spot

Miscellaneous
Balancer, 18" Gisholt Static, arr. m.d. with 4-speed head
Balancer, 18" Gisholt Static, Vert.
Broach, V-18 American
Bulldozers, Nos. 3 and 5 Williams & White
Bender, Wallace Hydraulic, cap. 3" rd. tubing 180°, with mtr.
Core Blower, No. 6 Demmler (3)
Gear Cutter, W. & W., cap. inc. gears up to 96" dia. x 52" face
Pipe Threader, Nos. 3 Will., m.d. & m., 6" c.
Polishers, U.S. Elec. Tool, m.d. in base 4-brg., h.d. type (16)
Punch, Model ID Cleveland Single End, m.d. cap. 2 holes thru 1⅛", 36" thrt. lat. t.
Punch, Long & Alstatter, 40" throat
Rivet Heaters, Berwick (4)
Shaper, 18" American Hydraulic
Thread Roller, No. 10 Waterbury Farrell
Trucks, El. Parker Elec. Mule: 3-ton Auto. Low-Lift.
Threader, Rickert & Schaeffer Horiz. with auto. index

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Left—100 Series

Left Hand-Reverse Image, Right Hand Shown

Tool No. RH	LH	Shank Size
R-100	L-100	¼x¼x2
R-101	L-102	5/16x5/16x2¼
R-103	L-104	⅜x⅜x2½
R-105	L-106	7/16x7/16x3
R-107	L-108	½x½x3½

Right—200 Series

Tool No.	Shank Size
200	¼x¼x2
201	5/16x5/16x2¼
202	⅜x⅜x2½
203	7/16x7/16x3
204	½x½x3½

Below—300 Series

Tool No.	Shank Size
300	¼x¼x2
301	5/16x5/16x2½
302	⅜x⅜x2½
303	½x½x3½

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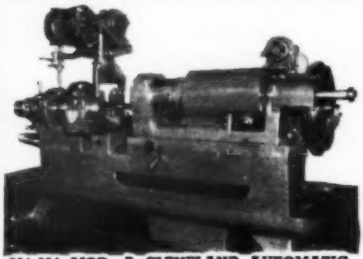

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No. 7 Foster, M.D. Bar Fd. Pwr. Fd. to Turret, 3" cap., rebuilt

AUTOMATICS

⅞" Mod. G Gridley Ser. 8,000 M.D.
1¼" Mod. G Gridley Ser. 10,000 P.D.
1¾" Mod. G Gridley Ser. 7,000 P.D.
1¼" Cleveland Model A 28,000 P.D.
4¼' Model A Cleveland

LATHES

14"x8' Hendey, Q.C. Taper Attach., M.D.
11"x4' South Bend Q.C., M.D.

MISCELLANEOUS

24" Smith—Mills, Tilt Table, Frict.
No. 2 Kempsmith Mill. Mach., Plain
No. 2 Cincinnati 12"x36" Univ. Cyl. Gdr.
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Baush & Natco Multiple spindles
3½' Fosdick Plain Radial

GEAR CUTTERS, Brown & Sharpe No. 4-48"
Cincinnati No. 4-36"

GEAR HOBBERS, Lees-B No. 5 & 5A

GRINDERS, Heald Nos. 55, 60, & 65
Norton, 16x36" Crankshaft
Norton, 6x32, 10x18, 24 & 36" Plain
Cincinnati Face Mill, Excello M.D. spdle.

LATHES, Hendey, q. c. 16"x8' & 18"x10' M.D.
Hamilton, 16"x6' Cone, Q.C.
Schumacher & Boye, 24"x10' Cone, Q.C.
No. 7 Foster Turret

MILLS, Newton No. 2 Key Seat
Rockford No. 2B Universal Complete, Western Drive & Motor

PLANERS, 30"x30"x18' Gray, 2 heads
44"x44"x18' Niles, 4 heads

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No. 94 Bliss, Solid Back
No. 661 Toledo 150 ton Embossing
No. 662 Toledo 400 ton Embossing

SHAPERS, 24" Rockford, M.D.
14" Gould & Eberhardt, M.D. & Reeves.

SLOTTERS, 3½" Rhodes, M.D. 8" R.T.
5½" Industrial—18" Rotary Table

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67' Chicago Pneumatic, NSB.
136' Chicago Pneumatic, NSB.
136' Ingersoll Rand, ERI.
166' Ingersoll Rand, ESI.
355' Ingersoll Rand, ERI.
357' Bury
369' Chicago Pneumatic, NSB.
550', National 3-cyl.
620' Sullivan WJ3
676' Ingersoll Rand, XRE2
706' Sullivan, WJ3
868' Chicago Pneumatic, OCB.

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Nos. 1, 3 & 4 Lapointe
No. 3 Lapointe double
No. 3 American rack
2 ton American vertical

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3½', 4' & 5' Western radial
5' American motor-on-arm
6' N-B-P univ. radial
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Nos. 6D, 11D & 16D Moline
10D Moline cylinder borer
Nos. 17 & 25 Foote Burt
No. 2 Colb., 1, 2, 3 & 4 spdl.
All sizes and makes Sensitive

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24" Gleason gear planer
26" & 48" B. & S. auto. spur
36" G. & E. auto. spur
Lipe 2 spindle Chamferer
15" Gleason quencher
12HS&18H G & E hobbers
Nos. 3 & 12 Barber Colman

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Norton:—6"x32", 10"x36", 10" x50", 14"x50" & 14"x72"
Landis: — 10"x24", 10"x52", 12"x52" & 12"x72"
No. 1, 2 & 2½ Bath univ.
18", 24" 30" & 53" Gardner disc
24", No. 54 Gardner disc
12"x36" Diamond surface
24" Ingersoll tub
84" Diamond face
No. 3 Barber Colman hob
No. 1 Sellers univ. tool
8" No. 200 Heald rotary
Pratt & Whitney worm
No. 6 Bryant internal
No. 15 Norton lapper
17"x36"—48" Norton
Type B Model 84

ENGINE LATHES
14"x6' Walcott
14"x8' Lodge Shipley
16"x6' Lodge & Shipley
16"x8' Reed Prentice grd. hd.
16"x6' Monarch, geared hd., motor in base
16"x8' Hendey grd. hd.
16"x6' Cincinnati
16"x6' Hendey
18"x10'6 Rahn Mayer Carpenter
20"x10 Hendey grd. hd.
20"x10' Davis
22"x12' Morris, grd. hd., m.d.
24"x10' Schumacher & Boye
24"x10' LeBlond
24"x12' Lodge & Shipley
24"x16' Schumacher Boye
26"x15' Amer. grd. hd., m.d.
30"x12' Logde & Shipley
36"x22' Schumacher & Boye

TURRET LATHES
No. 2 SP Garvin
Nos. 4, 7 & 9 Foster
No. 4 Bardens & Oliver
No. 4 Cincinnati
No. 6 Warner & Swasey
2½" & 3" Jones & Lamson
21" Gisholt

BORING MILLS
36" Niles, car wheel
42" Bullard
52" Gisholt
60" Colburn
61" Bullard Maxi.

MILLERS
No. 1 Cincinnati, plain
No. 2 LeBlond, univ.
No. 2 Kempsmith, univ.
No. 2 Rockford, univ.
No. 4 Cincinnati, univ.
Model C Becker, rotary
No. 13B Brown & Sharpe, mfg.
Type AB Becker, vert.
36" Ingersoll rotary
48" Ohio tilted offset
48" Newton rotary
28", 37" & 42" Briggs
No. 1 Davis & Thompson
Type 45 Bilton Productomatic
No. 2 Bilton gear
Kent Owens (Toledo)
2M Potter & Johnston, auto.
Ingersoli hyd. planer type

PLANERS
24'x24"x24" Cincinnati crank
24"x24"x8' Rockford
30"x30"x10' Cincinnati
32"x32"x12' Niles
56"x56"x16' Gray

PRESSES
750 ton Baldwin Southwark triple act. hyd. toggle draw. 142½" bet. uprs., 84" shut height, 550,000 lbs.
500 ton No. 664B Toledo coinq. 40" between uprights
150 ton No. 661 Tol. coin.3"str.
100 ton French Oil Mchy. Co., hyd. press for strhtng. casts.
108" No. 796¼D Toledo Double Crank Toggle Drawing
No. 30E Cleveland
45" No. 151 Ferr. Dble. Crank
28" No. 71 Swaine dble. crk.
No. 21½ Bliss consd. OBI
Waterb. F. OBI 4½" shaft
No. 6 Bliss ConsolidatedO.B.I.
No. 6 Toledo O.B.I.
Nos. 75&76 grd. Toledo gap
Fremont gap, 75 tons
Wat. Farrell gap, 40 tons
No. P2 Ferracute
No. EG35 Erie punching
No. 94 Bliss Consd. Punch.
Nos. 55, 55½, and 56 Tol. str.
No. 65 Consd., straight side
No. 7 Rockford, straight side
No. 8-7 ZEH & Hn., strt. side
No. 74½ Bliss, straight side
No. 4 Massillon, str. side, grd.
No. 180 Toledo
No. 78 Toledo
Nos. 13 & 14 Toledo
80 ton Jarecki, screw

SAWS
4", 5", 7" & 8" Higley cold saws
6" Nutter & Barnes cold
6"x6" Peerless univ.
6"x6", 8"x8" & 12"x12" Racine hack saws
6"x6" Atkins
8"x18" Robertson
Reed Prentice band sawing & filing machine
2¼" Racine abrasive

SHAPERS
16", 20" & 24" Walcott
16" Kelly
20" Smith & Mills
24" Milwaukee
24" Columbia
24" Cincinnati shaper planer
24" Gould & Eberhardt
28" Ohio
36" & 48" Morton draw cut

PUNCHES, SHEARS, SHEET METAL
Nos. 1 & 2M Pettingell Hammers
⅝"x6" No. 54 Beloit
1¼"x1" Long & Allstatter
1¼"x1" Cleveland, horiz.
¾"x¾" Cleveland
1¼"x1¼"x⅛" Bertsch angle rolls
No. 1 Gray cutter
No. 16M Marshalltown serpentine
¾"x3', 5', & 7' Shuster wire straightener
Many spot and butt welders

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7' Dreses Plain, gear box
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3', 4', 5', 6' Niles-Bement-Pond Semi-Universal, gear box
5' Fosdick, gear box
5' Prentice, cone
5' Dreses Plain, gear box
5' Cincinnati-Bickford, gear box
5' Bickford, d.c. drive
5' American Triple Geared, gear box
4' Ryerson, gear box
4' Hammond Jack Knife
3' Carlton Sensitive
3' American Sensitive
2½' Fosdick, gear box

GRINDERS

12x72" Cincinnati, belted m.d., hyd. feeds
12x48" Modern, m.d.
12x42" Landis, belt
12x36" Modern, m.d.
12x36" Cincinnati, belt
12x18" Cincinnati Plunge Cut, m.d.
10x52" Landis, m.d.
10x50" Norton, m.d.
10x36" Norton, m.d.
10x24" Landis, m.d.
10x18" Brown & Sharpe, belt
6x32" Norton, m.d.
No. 50, 55, 60, 65 Heald Cylinder
No. 1 Gardner Disc, m.d.
No. 4 Gardner Disc, s.p.d.
No. 6 Diamond Disc, belt
No. 6 Gardner B.B. Disc, m.d.
No. 20 Gardner B.B. Disc, m.d.
No. 51 Besly Disc, m.d.
No. 120 Gardner Disc, belt
U. S. Electrical Tool Polisher, m.d.
Diamond Emery, m.d.
Mitchell Polishing Stand, m.d.
No. 6 Bryant Chucking, belt
No. 70 Heald Internal, belt
12x48" Modern Universal, belt
30x84" Diamond Face, m.d.
18x48" Diamond L.D. Face, m.d.
No. 255 Heald Rotary Surface, 12" chuck
No. 20 Heald Rotary Surface, 12" chuck
102" Covell Hanchett Knife, m.d.

GEARED HEAD ENGINE LATHES

16"x8' Reed
18"x8' American
18"x12' American, taper
18"x15' Lehmann, m.d., taper
20"x8' Greaves-Klusman, m.d., taper
20"x14' Hendey, m.d., taper
24"x8'6" Bridgeford
24"x16' Axelson, taper
24"x18' Lodge & Shipley, m.d., taper
26"x16' Bradford, taper
36"x20' American, taper
36"x22' LeBlond, taper
60"x27'6" Niles-Bement-Pond m.d.
60"x30'6" Niles-Bement-Pond

CONE HEAD ENGINE LATHES

14"x6' Hendey Yoke Head
16"x6' Springfield, taper, relieving
16"x8' Rockford
16"x10' Oliver
18"x6' Schumacher-Boye
18"x8' Cincinnati, taper
18"x8' Hendey
18"x8' American
18"x8' Muellar, taper
18"x8' Springfield, taper
18"x14' LeBlond, taper
19"x8' LeBlond, taper
19"x12' LeBlond, taper
20"x10' Davis, cone
20"x10' Lodge & Shipley
21"x8' LeBlond, taper
21"x10' LeBlond
21"x16' LeBlond, taper
22"x13' Niles
24"x10' Bridgeford
24"x10' Canada
24"x11' Shard
24-48"x16' McCabe 2 in 1
24"x16' Schumacher-Boye
24"x26' American, taper
26"x18' Schumacher-Boye, taper
36"x10' Schumacher-Boye
42"x24' Springfield

PLANERS

24" Cincinnati Crank, m.d., 1 head
24"x24"x8' Gray, 1 head
28"x28"x8' American, 1 head
30"x30"x8' Gray, 1 head
30"x30"x8' Gray, 2 heads
30"x30"x8' Pond, 1 head
30"x30"x19' American, 1 head, box table
32"x32"x8' Gray, 1 head
30"x30"x10' Cincinnati, 2 heads
34"x24"x8' Cincinnati, 1 head
36"x36"x10' Cincinnati, 3 heads
36"x36"x10' Whitcomb-Blaisdell, 2 heads
36"x36"x13' Niles-1 rail, 1 side head
42"x42"x20' Ohio, 2 heads
42"x42"x16' Rockford, 3 heads
60"x48"x16' Niles, 3 heads

AUTOMATICS

4 spindle 1¼" Model K Cleve. Auto., m.d.
4 spindle ⅞" Model M4 Cleveland, m.d.
⅜-½" Cleveland Model B
⅞" Cleveland Model A

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No. 6A Potter & Johnston Automatic, m.d.
No. 6D Potter & Johnston Automatic, m.d.
No. 23, 24 New Britain Automatic

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12" Landis, m.d.
No. 2 Bignall & Keeler, m.d.
2" Jarecki, m.d.
2" Landis Pipe & Nipple, m.d.
2" Merrell, m.d.
2" Saunders, m.d.
No. 4 Bignall & Keeler, m.d.
4" Eaton, Cole & Burnham, belt
8" Bignall & Keeler, belt

BORING MILLS

30" Bullard, 1 head
42" Gisholt, 2 heads, m.d.
48" Niles Car Wheel Borer, belt
51" Baush, m.d., 2 heads
7-10' Niles, 2 heads, m.d.
7' Niles, cone, 2 heads

HORIZONTAL BORING MILLS

No. 2 Barret, 5" bar
No. 4 Niles-Bement-Pond, 5½" bar
Niles-Bement-Pond Cylinder Borer, m.d., 12" main bar

TURRET LATHES AND SCREW MACHINES

No. 3L Gisholt, m.d., chucking
No. 0 Brown & Sharpe, cone
No. 2 Pratt & Whitney, cone
No. 2 Warner & Swasey, cone
No. 4 Woods Tilted, cone
1" Briggs, cone
2x24" Jones & Lamson, m.d., bar
2 spindle Jones & Lamson Steel Head, m.d.
3x36" Jones & Lamson Geared Head, chck.
3x36" Jones & Lamson Geared Head, bar
2 spindle 3x36" Jones & Lamson, m.d.
20" Acme Flat Turret, cone
18", Libby Type A, m.d.
26" Libby Type C, m.d., 7½" hole
21", 24" Gisholt Tilted Turret

SHAPERS

16" Davis, m.d.
20" Hendey, belt
20" Steptoe, cone
24" Barker, cone
24" Cincinnati, cone
24" Gould & Eberhardt, cone
24" Gould & Eberhardt, gear box
24" Rockford, cone
24" Rockford, gear box

GEAR CUTTERS AND HOBBERS

6", 18" Gleason Straight Bevel
16" Cincinnati Gear Hobber, m.d.
No. 1 Lees-Bradner Gear Hobber, m.d.
No. 3-26" and 3-36" Brown & Shear Gear Cutters
No. 3 Heavy Brown & Sharpe Gear Cutters
No. 3-26" Cincinnati Gear Cutter
No. 5A Lees-Bradner Gear Generator
No. 6-60 and 6-72" Brown & Sharpe Gear Cutters
No. 12 Barber-Colman Gear Hobbers
No. 61 and 615 Fellows Gear Shapers
Gleason Spiral Bevel Gear Rougher
Gleason Bevel Gear Tester
Rochester Gear Tooth Rounder
Schuchart & Schutte 10" Gear Tooth Rdr.

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No. 35 Oesterlein, cone, universal
No. 5G LeBlond Universal, s.p.d.
No. 3 Cincinnati Plain, cone
No. 3H LeBlond Plain, cone
No. 15 Garvin Plain, cone
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No. 7H Becker Lincoln Type
C66A Newton 3 spindle Continuous
Carter & Hakes Mfg.
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48" Oesterlein Tilted Offset, m.d.

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20" Barnes All Geared Self-Oiling
21", 24" Aurora
21" Superior
21", 25" Weigel
22" Barnes All Geared Self-Oiling
24" Barnes All Geared Self-Oiling
26" Barnes
32", 36" Aurora
36" Cincinnati Bickford
No. 2, 4, 22 Colburn Mfg.
D4 Colburn
No. 25-36" Foote-Burt
No. 310, 314, 315 Baker
No. 220 Baker 2 spindle

BALL BEARING DRILLS

1 spindle Allen
1 spindle Leland & Gifford
1 spindle Henry & Wright
2, 4 spindle Allen
2, 3 spindle Edlund, m.d.
2, 3, 4, 5 spindle Henry & Wright
2, 3, 4 spindle Leland & Gifford, m.d.
2 spindle Textile Horizontal, m.d.
3 spindle Demco, power feed
3 spindle Sipp, power feed
4 spindle Edlund, m.d. on each spindle
4 spindle No. 2 Fosdick
6 spindle No. ½ Avey

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4 Spindle Barnes Gang Drill

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16x42" Landis Pl. Cyl., Self-Cont., Mtr. Dr.
No. 3 Diamond Surface, 48" Travel, All Feeds
No. 78 Wilmarth & Morman Surface
No. 6 Rivett Internal

LATHES

12"x5' Hendey Q.C.G., Chuck
14"x6' Flather, Q.C.G.
14-28"x7' Barnes Sliding Bed Gap, Loose Change Gear
24"x12' Porter, Q.C.G., M. Dr. & M.
24"x8' South Bend, H.D., L.C.G.
11"x4' Seneca Falls Short-Cut, M.D.

ALL LATHES CAN BE MOTORIZED EASILY

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No. 4 Bardons & Oliver, Hex Turret, for Chkg.
No. 3 Superior Turret Lathe, Automatic Chucking Bar Feed
26"x41" Hole Libby Geared Head Full Universal Turret Lathe, Face Plates, Pot Chucks, Boring Bars, Turret Tools, Fine Condition
No. 3 W. & S. Heavy Duty Full Univ., 3-¼" Hole, Chuck, and Equip.

MILLS

No. 0 Kempsmith Universal
No. 2-Y Brown & Sharpe Plain, with V. Hd.
No. 3 and No. 4 Cincinnati Plain (Knuckle)
18"-24" Cincinnati Automatic & Duplex
8' Burr Keyseating Mill
Hendey Lincoln Type Mill
No. 2-A Becker Vertical Mill

MISCELLANEOUS

(7) ¾"-4"-1¼" 4 Spdl. Gridley Model F automatics, with collets, Threading Spindles
3-¼" Sgle. Spdl. Gridley Auto., Bar Equip.
42" Wickes Blue Print Machine, M.D., Model 20, Black on White, Bargain
No. 3 Brown & Sharpe Gear Cutter
32" Cincinnati Gear Cutter
24"x24"x8' American Planer, Motor Dr.
(2) 900 Ton Zeh & Hahnemann Percussion Presses, M. Dr., 25" Stroke, Bed 36x50". Tie Rod, Like New
93"x104" Pyramid Rolls—Not slip end
(2) 9x9" Peerless Shaping Saws
20" Columbia Shaper, M. Dr.
20" American Shaper, M. Dr.
20" Ohio Shaper, M. Dr.
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8'x18 Ga. Ohl Foot Shear

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Radial, 3 ft. Fosdick
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Rail, Foote-Burt Nos. 2 & 4, 4 spindle
Prentice, 4-spdl. high-speed
Allen 5-spdl. high-speed, BB.
Allen BB Type B sgl. spdl.
Demco DAH ⅜" bb, M.D.
25" Bickford, sl. hd., BG & PF.
25" Gould & Eberiardt, BG & PF
28" Hamilton sl. hd. BG & PF.

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Disc, No. 6-20 Besly
Disc, No. 41 Besly, motor dr.
Disc, No. 220 Badger & press
Drill, New Yankee, D.E.
Elec., Hisey-Wolf 7-WFA, BB
Elec., Hisey-Wolf 3-6 ROA BB
Internal, Madison; No. 65 Heald.
Plain Cylindrical, No. 2 Morse
Surface, No. 1 La Salle.

LATHES:

26"x14' Niles, PCG
20"x½' Rahn-Larmon QCG
20"x8' LeBlond QCG, DBG
20"x8' Bradford, PCG MD.
18"x8½' Rahn & Mayer PCG
16"x8' Fay & Scott QCG
16"x8' LeBlond PCG
16"x6' Monarch DBG QCG
14"x6' Rumsey, PCG
9"x3' South Bend 420-Y MD.

LATHES—Turret:

2'x24" Jones & Lamson
12" Reed-Prentice BG
No. 3 Foster 14½"x4'

PRESSES:

Arbor, Fameo and Atlas.
Cam Drawing, 69-N Bliss
Dbl. Crank, No. 37 Excelsior
Foot, Fameo and No. 4 Swaine
OB.I. Wold, 1350 lbs.
Punch, No. 5 Bliss Stiles

PUNCHES & SHEARS:

SE. Cleveland C ¾ in ½", 26" thr.
SE W-W 14½, 25" thr. 1 in 1" MD.
Rock River L, 24" thr. ½ in ¼"
DE 1-10 Badger ½ in ½", 10" thr.

SAWS:

Band metal, 14" Racine
Cold, Higley, 20" saw
Hack, No. 3 Robertson 6x6"
Hack, No. 14 Atkins 6x6"

SHEARS:

Rotary Bevel, Lennox ¾"
Square, Stark 9 ft. 18 ga. cap.
Square, 48" Excelsior, pwr. gap.
Square, 38" Bertsch, power
Square, 36" D&K, 16 ga. pwr.
Throatless, 18 H Marshalltown

THREADERS, Pipe & Bolt:

Murchey, ¾" dbl. head, bolt
Pipe, 2" Oster No. 302

MISCELLANEOUS:

Bender, No. 15 Wallace, 1" cap.
Dbl. Seamer, Swaine, 36" cap.
Compressor, Herron-Bury CCB, 14x9x8", 6' tank, 20 HP mtr.
Groover, 30" Toledo
Hammer, 50-lb. Little Giant, MD.
Miller, No. 14 Valley univ.
Planer, 30"x30"x8' Wheeler
Roll, Corrugating, 10" Robinson
Screw Mach., No. 2 Jones & Lamson
Shaper, 24" Gould & Ebert., BG
Shaper, 26" Hendey planer type dr.
Valve Refacer, ½" Black & Decker

Brown Mchy. Co., 2333 N. Ninth St., St. Louis, Mo.

BORING MILLS, Horizontal

4⅛" bar Bement Miles Knee Type

BORING MILLS, Vertical

14'-20' N.B.P. 3 M.D.
10'-16' Niles Ext. Type
72" Betts, Hvy. 77" swing
51" N.B.P. 2 hds., M.D.
51" Bullard, P.R.T.
36" Bullard Rapid Pro.

DRILLS, Radial

6' Bickford S.P.D.
5' Ryerson, motor on spindle
5' Western S.P.D.
4' Dreses Plain
4' Western S.P.D.
24" Aurora Upright
No. 13 P. & W. Multi

GRINDERS

3"x18" Norton, Self Cont. (7)
8"x54" Fitchburg Pl., m.d.
15"x15"x96" Norton Open-side Surface, M.D.
16"x68" Landis Crankshaft
No. 6 Bryant Chucking
No. 3 Landis Universal
No. 2 Sellers Univ. Tool
18" Besly No. 26 Disc
18" Badger No. 220 Disc
20"x18" Landis, Cyl., S.P.D.
20"x96" Landis Univ.
No. 11 Landis Tool & Cutter
No. 55, 60 and 65 Heald Cyl.
90" Bridgeport Shear Knife

LATHES

9"x20" Porter-Cable
12"x5½' Seneca Falls
14"x6' American Q. C. G.
14"x6' Monarch, Q.C.G., Cone
14"x6' L. & S., T.A., M.D.
16"x6' Sidney, Q.C.G.
18"x8' Whitcomb-Bl., grd., hd., M.D.
19"x12' LeBlond Grd. Hd.
20"x12' Amer. 3 cone
20"x12' Hendey, Q.C.G., Cone
20"x14' Monarch, Q.C.G.
20"/42"x10' Fay Scott, Gap, M.D.
21"x8' Conradson, Grd. Hd.
22"x12' Amer. 4 cone
22"/24"x12' L. & S., Q.C.G., M.D.
24"x16' Amer. Grd. Hd.
24"x12' Putnam Grd. Hd., M.D.
24"x12' Reed Prentice, Grd. Head, T. A.

LATHES (Continued)

24"x15' N.B.P. Q.C.G., T.A.
26"x11' Wickes Heavy Cone
24"/32"x24' LeBlond Q.C.G. cone, raised in sand
30"x12' L. & S., Cone, Q.C.G.
30"x16' N.B.P. Axel & Journal, Center Drive, M.D.
32"x18' Fifield, triple grd.
36"x14' Rahn Larmon, Q.C.G., Cone
36"x30' Putnam Grd. Hd.
42"x34' S. & B., Grd. Hd., M.D.
42"x30' Johnson Grd. Hd. M.D.
42" N.B.P. Center Dr. Whl.
48"/60"x14' Putnam, Heavy
48"x16' Fifield Cone
48"x36' Fifield, M.D.
90" N.B.P. Heavy, Wheel
Peerless Banding Lathe, M.D.

MILLERS

No. 2B K. & T. Univ.
No. 2 Cincinnati, Plain
No. 3 Ingersoll Knee Type Vert. & Horizontal Spindle
No. 4B Becker Vert.
No. 5 Becker Vert. Rotary
No. 5 Cincinnati, Plain
No. 12 P. & W. Profiler
No. 7H Becker Lincoln Type (2)
2" Cincinnati Semi Auto
42"x42"x8' Bement Pond, Adj. Rail Miller, 4 hds., hd.
No. 6 Jackson Die Sinkers (3)
No. 1 Standard Hand
U. S. Hand Miller, M.D.

PLANERS

60"x60"x14' Niles 4 hds.
48"x48"x12' D&H Openside
42"x42"x16' N.B.P., M.D.
36" Newton Rotary, M.D.
36"x36"x12' Ryerson Opens.
36"x36"x12' Chandler, 3 hds.
30"x30"x10' D. & H. Openside
27"x27"x6' W. & P., 1 Hd.
24"x24"x12' American
24"x24"x7' Niles
16"x16"x48" Walter Bros.

TURRET LATHES

2½"x26" P. & W. Grd. Hd.
No. 3 Bardons & Oliver Fox Lathe
No. 4 Bardons & Oliver Fox Lathe
No. 4 Foster, 1-9/16" capty.
21" Gisholt, 3 step cone
24" Gisholt 6½" H.S., M.D.
Bardons & Oliver Fox Type
21"x24" & 3"x36' J. & L.

MISCELLANEOUS

Automatics ⅝", 1¼", & 2" Clevel. Model A Sgl. Sp.
Automatic, 2½" Gridley, 1 Sp.
Automatics, 2-¾" - 3-¾" Clevel. Model A Sgl. Sp. (2)
1¼"—⅜" Gridley 4 spin. Model (F (4)
Billet Breaking Mach., Ajax
Bolt Threader, 2" Landis
Bolt Threader, 2" Natl.
Bolt Threader, 2" Wms., Dble. Head, Motor Drive
Chucking, No. 34 New Brit.
Die Sinkers, No. 6 Jackson (3)
Gear Cutter, 48" Cinci.
Gear Cutter, 110" Newton Spur
Gear Hobber, 6" Pfauter
Gear Planer, 24" Gleason
Gear Shaper, No. 612 Fellows
Hammer, 600 lb. N.B.P. Stm.
Hammer, No. 3B Nazel M.D.
Header, 1½" Acme Rivet
Header, 2" Acme Steel
Keystrs., Nos. 1 & 3 Bakers
Keystrs., Nos. 4 & 6 M & M, M.D.
Pipe Mach. 8" & 12" Williams
Pipe Machine, 12" Saunders
Pipe Mach., 12" Curtis & C.
Pipe Mach., 2" Bignall Keeler
Press, No. 3A Bliss, Dble. Ck.
Press, No. 61 Spec. V. & O.
Presses, No. 18 Bliss B. & Fl.
Punch & Shear, Schatz Cobn.
Punch, 1"x⅜" shears, ⅝" pl.
Punch 54" H & J No. 2 D.E.
Rolls, 6"x½" H. & J. No. 2
Rolls, 8"x½" H. & J. No. 2
Rolls, 12' Corrugating—Heavy
Saw, 6" Avey Milband
Saw, 6" Gorton No. 2B Inter.
Shaper, 16" Steptoe M. D.
Shaper, 36" Morton, railroad
Shaper, 32" Morton Draw Cut
Shaper, 24" Ohio, Cn. or M.D.
Shaper 24" Rockford. cone or M.D.
Shaper, 28" Ohio Dreadnaught M.D.
Shaper, 16" Stockbridge Cone
Slotter, 15" Putn., D.C., M.D.
Slotter, 18" Newton, Hvy. D.
Slotter, 20" Betts, D.C., M.D.
Slotter, 24" Dill A.C., M.D.

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AJAX No. 8, Face of crosshead 18"x80"; Stroke 24; Double clutch wheel 32"x6¼"; Belt-dr.
WILLIAMS & WHITE No. 7, Double Geared; Crosshead 16"x70"; Stroke 22"
Portable Pneumatic Bulldozer, WESTINGHOUSE, Two 16"x12" air cylinders; 4" steel ram; Mounted on steel frame wagon truck
Portable Pneumatic Bulldozer, WESTINGHOUSE, One 16x12" air cylinder; mounted on steel frame wagon truck; Two available

PUNCHES AND SHEARS

HILLES & JONES No. 2, Single-end, 60" depth of throat; with Jib Crane; 2" stroke
SOUTHWARK No. 7, Single-end, 54" depth of throat; 25" gap; Stroke 2"
BEATTY No. 6, Single-end, 25" depth of throat; 21" gap; Stroke 1¼"
WILLIAMS & WHITE No. 14, Single-end, 15" depth of throat; 23" gap; 1¼" stroke
BEATTY No. 7, Single-end, 15" depth of throat; 21½" gap; Stroke 1¾"
BEATTY No. 9, Single-end, 15" depth of throat, 33" gap; Stroke 2¼"
STANDARD, Single-end, 6" throat; 1" stroke

FORGING MACHINES

4" cap'y, NATIONAL, Geared Heading, Upsetting and Forging; Belt-dr.
4" cap'y, AJAX, Geared Heading, Upsetting and Forging; Belt-dr.; Lot of dies
2" cap'y, ACME, Geared Heading, Upsetting and Forging; Flywheel 38"x8"; Lot of dies

HAMMERS

1100-lb. CHAMBERSBURG, Single Frame Steam; or Air; Lot of dies
250-lb. MAXILLON, Single Frame Steam
200-lb. BRADLEY, Helve, Double flange pulley drive; Lot of dies; Two available
50-lb. LITTLE GIANT, Belted motor drive

RIVETERS

HANNA, Pneumatic, 70-ton cap'y; 75 reach; 25½" gap; 15" cylinder
HANNA, Pneumatic, 50-ton cap'y, 102" reach; 16" gap; 12-4" cylinder
CHAMBERSBURG, Pneumatic, 50-ton cap'y; 24" reach
CHAMBERSBURG, Hydraulic; 100" gap; 6¼" cylinder; Equipment for increasing gap to 113"; Operating valve

DRILLS

Six-Spindle, NILES, Sliding head; Spindle diam. 1¾"; Arch bar type; Power feed
21" swing, CANEDY OTTO, Single Spindle; 16" diam. table; Wheel and lever feeds; T. and L. pulley dr.

SHEET METAL EQUIPMENT

Brake, ROBINSON 8-ft., Hand power
Forming Roll, PECK, STOW & WILCOX, 3-Roll; Rolls 2"x30"; Hand Power
Crimper, PECK, STOW & WILCOX No. 11-B, 34" wide; Hand power

BLOWERS

MAHR, Pres. Blower, 2000 cu. ft.; 10 oz. per cu. in.; 3450 RPM; with 10 H.P. motor, 3/60/220
MAHR, Pres., 1300 cu. ft. per min. at 10 oz. per cu. in., 3470 RPM; w. 5 H.P. mtr., 3/60/220
MAHR, Pres., 1100 cu. ft. per min. at 10 oz. per cu. in., 3470 RPM; w. 5 H.P. mtr., 3/60/220
MAHR, Pres., 900 cu. ft. per min. at 10 oz. per cu. in., 3440 RPM; w. 3 H.P. mtr., 3/60/220
MAHR, Pres., 400 cu. ft. per min. at 10 oz. per sq. in., 3410 RPM; with 2 H.P. motor, 3/60/220; (2 available)
MAHR, Pres., 200 cu. ft. per min. at 10 oz. per cu. in., 3450 RPM; w. 2 H.P. mtr., 3/60/220
JOHNSTON No. 2, Pressure; 3" bottom discharge; with 2 H.P. motor, 3/60/220, 3510 R.P.M.
AUTOVENT Fan and Blower; 12" wall ventilating fan; with ¼ H.P. motor, 3/60/220, 1150 RPM

CRANES

Locomotive Crane, AMERICAN HOIST & DERRICK CO., Standard Gauge; 35' boom; Cap'y 25,000-lb. at 12' radius—7100-lb. at 30' radius; 150 H.P. Oil Fired Vertical Boiler; ENBERG, 4½x4" Vertical Steam Engine
Hand Crane, 3-ton cap'y, ROEPER, 30' span; 15' lift; with 2-ton INGERSOLL Rand Pneu. Hoist
Hand Crane, 3-ton cap'y, WHITING, 20' span; 18' lift; Floor control
Hand Crane, 3-ton cap'y, ROEPER, 18' span; 18' lift; Floor control
Hand Crane, 3-ton cap'y, WHITING, 15' span; 18' lift; Floor control; (6 available)
Hand Crane, 3-ton cap'y, ROEPER, 15' span; 18' lift; Floor control
Hand Crane, 3-ton cap'y, WHITING, 15' span
Jib Cranes, (8), 12" I-beams; 19' to 30' booms; 11' and 12' Upr. posts

FURNACES

MAHR, Heating Furnace, 18' wide, 12' long, 6' high; Brick lining; 2-ends; 4 counterbalanced iron doors; Two 82"x12'x38" heating surfaces; Combination oil and air burners
MAHR, Heating Furnace, 10'6" wide, 11' long, 72" high; Brick lined; Service 2 ends; 4 counterbalanced doors; Two 32"x11'x42" heating surfaces; Combination oil and air burners
MAHR, Forging Furnace, 36"x87"x38" high; Brick lined; 52"x18"x18" heating surface; 48" x8" opening; Oil and air burners
MAHR, Forging Furnaces (2) 68"x28"x36" high; Brick lines; 52"x18"x18" heating surface; 48"x6" opening; Oil and air burner

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MAHR, Open Steel Heating Furnace, 31"x76"x 26" high; 9" fire brick lining; oil and air burner
MAHR, Forging Furnace; 5' wide, 5'6" high; brk. lined; 30"x56"x30" heating surface; 17"x18" opening; Oil and air burner
Steel Heating Furnace, 54"x24"x42"; Brick lined
JOHNSON Rivet Heating Furnace No. 112; 51"x 25"x31". Brick lined; 32"x18"x18" heating surface; Heat Deflector; 8"x27" opening
MAHR, Rivet Heating Furnace; 24"x30"x20"; Brick lined; 18"x15"x15" heating surface; 7"x 14" opening; Oil and air burner
MAHR, Rivet Heating Furnace, 24"x52"x24"; Brick lined; 32"x18"x18" heating surface; Heat deflector; 12"x30" opening; Oil and air burner
JOHNSON Type "A" Rivet Heating Furnaces (14) Brick lined; 14"x24" welder steel oil tank; air and oil burner (14 available)
JOHNSON No. 53 Combination Oil and Air Burner

WOODWORKING MACHINERY

Car Borer, GREENLEE No. 326, Vertical and Radial Car Borer; 3-spindle; 18"x74" power roller table; Motor-dr.
Car Borer, BENTAL & MARGANANT, 3-spindle, Vertical; with 2 univ. side attach.; 27"x10' metal table; 26" from col. to center of spdl.; Mtr-dr.
Moulder, AMERICAN No. 22, four-sided, Belt-drive
Moulder, HOUSTON 8-in., four-sided; Belt.-mtr-dr.
Band Re-Saw, FAY & EGAN, 42" cap'y, Metal frame; 44" face metal wheels; Belted motor dr.
Band Saw, CRESCENT, Metal frame; 30"x26" tilting iron tbl.; Iron rubber tired wheels; Belt-dr.
Band Saw, JONES SUPERIOR, 36" cap'y, 30"x 38" iron tilting table; Belted motor drive
Rip Saw, FAY & EGAN, Metal Frame; Table 39¼" x72"; Belt-dr.
Cut-off Saw, BENTEL & MARGANANT No. 118, Heavy Automatic; Metal Frame Railway Cut-off Saw; 30" saw cap'y; Belted mtor-dr.
Cut-off Saw, STANDARD, Portable; 23"x40" metal table; Belted motor dr.
Variety Saw, MEREEN JOHNSON, 2-saw arbor; 42"x72"; Belted Motor-dr.
Swing Saw, OSHKOSH, 30", Portable, metal frame; Heavy Duty; 32"x38" iron tbl.; Belt-dr. Fl.-type
Swing Saw, AMERICAN, 6-ft. Metal frame; Belt-dr.
Swing Saw, NORTHFIELD, 6-ft., B.-dr. (2 avail.)
Swing Saw, GREEN, 30" Portable, Metal Frame, Floor-type, 21"x29" table; Belted motor-dr.
Mortiser, GREENLEE No. 231, Vertical Sgle. Spindle, Hollow chisel, Two univ. bor. attach.; mtr-dr.
Mortiser, GREENLEE No. 238, Extra range, Vertical Single Spirdle; Hollow Chisel; Motor-dr.
Sander, CRESCENT, "Floor-type" Double-end Disc Sander; 18" disc wheels; with 10"x24" rock. tbl.
Four-Sided Planer or Timber Sizer, S. A. WOODS No. 8, 30"x16"; Belted motor drive
Trimmer, OLIVER No. 3, Hand Power Universal

MISCELLANEOUS

Accumulator, SOUTHWARK, Hydraulic, Moving cylinder type; 12" diam., 13' high, ¼" steel vertical ballast tank; ½" steel bottom plate; Cap'y 130 gals. for 1500 lb. pressure; 15" diam. cast iron ram, 15' long; 24" diam. cylinder; 4" hydraulic shock valve
Tractor, with FORDSON Engine
Pipe Threader, WILLIAMS No. 1-B; cap'y ¼" to 2" pipe
Grinder, OLIVER No. 39-C; Iron frame grindstone, 36" diam., 6" face; Motor-dr.
Hack Saw, DIAMOND "Sterling," Cap'y 5"x5"; 12" saw blade; T. and L. pulley
Pump, GARDNER Horizontal Duplex, Air driven oil pump; size 4½"x3"; Steel fitted
Pump, BLACKMER Size 50; 1" rotary oil pump; Brass lined; 1" pipe connection; Direct motor-dr.
Test Rack, WESTINGHOUSE, Improved 3T Hydraulic Test Rack; for triple valves
Winch, SHEPARD Single Purpose Electric; 700 lb. cap'y; Cast Iron drum 6"x9"; with 7½ H.P. motor, 3/60/220
Winch, EMERSON BRANTINGHAM, 8"x8" Double Cylinder Friction Single Drum; Single speed; Air operated Winch; Drum 18"x20"; 14" diam. x 13" winch hd.; 1½" cast iron operating valve
Winches, ORR & SEMBOWER, Air, Twin cylinder; about 8" diam. x 12"; Drum 14" diam., 27" long; (2 available)
Scale, 50-ton FAIRBANKS Single Beam Railroad Track Scale, with 1000 lb. cap'y tare beam; 50' platform; Two 18"x50' 80lb. I-beams; 32½" cast iron pillars
Scale, GASTON, Portable Platform, 18"x26"; Double brass beam; (two available)
Scale, HOWE, 12½"x15" Double Beam Counter Scale; with Brass scoop; Upper beam 10lb; Lower beam 40lb.; (2 available)
Tank, 11,250-gal. cap'y, Steel Oil Tank
Tanks, 3000-gal. cap'y, 5' diam., 24'6" long, ¼" thick; Convex heads; with 16" cast iron manhole; 36" diam. x 24" steel dome; (2 available)
Tank, Oil, 3500-gal. cap'y, 5' diam., 24½' long, Horizontal; Steel dome 36" diam. x 24" high; With 16" diam. cast iron manhole
Tank, 5000-gal. cap'y, 6' diam., 24' long x ¼" thick; Oil Tank
Tank, Oil, 1000-gal. cap'y,
Air Receiver, Vertical, 5' diam., 18' long, 12"x16" manhole
Air Hoist, 2-ton cap'y, CHISHOLM MOORE
Air Hoist, 3-ton cap'y, CHISHOLM MOORE
Equalizers (8) 10" and 12" I-beams, from 24' to 34' long (8 available) for lifting long loads

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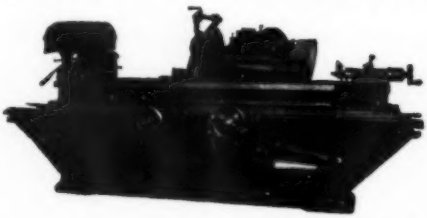

6"x32"	10"x72"	16"x72"
10"x18"	14"x36"	16"x120"
10"x24"	14"x50"	18"-24"x96"
10"x36"	14"x72"	18"x96"
10"x50"	16"x50"	21"x96"

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LANDIS 5" EXTERNAL RACE GRINDER
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Axle Lathe, NILES-BEMENT-POND, 24"x 12', Sgl. Carriage, Mtr. Base
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Boring Mill, 30" COLBURN Ver., 5-Position turret on Rail, Cone Dr.
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Gear Cutter, 48"x10" BROWN & SHARPE, Sgl. Pul. Belt Dr.
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Grinder, 10"x30" WEBSTER & PERKS Pl. Cyl., Ball-Bearing
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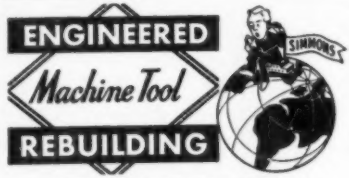
Grinders, Two—EAMES Yankee Twist Drill, 2" cap., Belt Dr.
Grinder, 30" DIA. Face, Table working Surface 23½"x86½", Arr. for Texrope, Mtr. Dr.
Grinder, No. 1 DIAMOND, surface, 12"x24" Magnetic Ck. Belt Dr.
Hammers, 80 lb.-85lb. & 200 lb. BEAUDRY & BRADLEY
Keyseater, No. 4 CATLIN, cap. 3½", Belt Dr., Large Asst. Columns, Cutter Bars & Cutters
Lathe, 13"x6' WILLARD, Q.C.
16"x8½' GREAVES - KLUSMAN, Loose Change, Cone Dr.
18"x6'4" AMERICAN Q. C., 4-Step Cone, Sgl. Bk. Gears
18"x8' LODGE & SHIPLEY Patent Hd. Q.C.
Two—18"x12' SPRINGFIELD 5-Step Loose Change Gears
20"x13' LODGE & DAVIS 4-Step Cone, Blocks to 37½". Taper Att.
24"x10' GRANT & BOGART Hvy., 5-Step Cone, Taper Att.
24"x12' NEW HAVEN Q.C., 3-Step, Dbl. Bk. Gears, Rebuilt
24"x12' BRADFORD 5-Step Pl. Chg. Gears
Three—26"x12' REEDS, 4-Step Cone, Sgl. Bk. Gears, Pl. Chg. Gears 96" Centers. Lot $750.00
26"x45"x14' SCHUMACHER & BOYE (McCabe) Dbl. Spdl., Chg. Gears
42"x20' LODGE & DAVIS 5-Step Sgl. Bk. Gears, Pl. Chg. Gears, 13'8" Centers
17"x8' LeBlond Q.C.
18"x8' LODGE & SHIPLEY Q.C.
Turret Lathe, No. 4 BARDONS & OLIVER, Fric. Bk. Grd., Bar Feed, 1-¾" Hollow Spdl.
No. 3 BARDONS & OLIVER, Fric. Bk. Grd., Bar Feed, 1-¾" Hollow Spdl.
No. 6 BROWN & SHARPE, Fric. Bk. Grd. 1-¾" Spdl.
Brass Lathe, 18"x6' AMERICAN TOOL & MACHINE CO., Bk. Grd., Univ., Chasing Bar, 15-Hobs
1¼" DRESES Fric. Bk. Grd., Bar Feed, Mtr. Base, Pan Bed, 1-⅜" Hole in Spdl., Collets
Brass Lathe, 20"x6' AMERICAN TOOL & MACHINE CO., Fox Monitor, Chasing Bar, 6-Hobs, Set Over Head Stock
21" WARNER & SWASEY Grd. Hd. (Dry Hd. Type), Bar Feed, 2-⅝" Hollow Spdl.
24"x7' DAVIS Fric. Bk. Grd. Pwr. Feed, 2-¼" Hollow Spdl., 3-Step Cone
No. 3 FOSTER Pwr. Feed, 3-Step Cone, 2-7/16" Hollow Spdl. Timken Bearings
22"x8½' AMERICAN Grd. Hd. Serial 36231. Turret on Bed
12" Dividing Hd. Pl. 1-Index Plate
16" Dividing Hd. Pl. 1-Index Plate
Millers, Two PRATT & WHITNEY Mfg., Cone Dr., Tables 7½"x32"
Pipe Machine, No. 9½" MERRILL, Cap. 2½" to 8", A. C., Mtr. Dr., 110-220 Volt Dies for 1" and 2" $32.00 Extra, Rebuilt
Punch & Shear, No. 8 LONG & ALSTATTER, Dbl. End, Belt Dr., Throat 3½" Cap. ⅜" thru ¼", Shears 2"x¼"
LONG & ALSTATTER (Old Style), 9" Throat, Cap. 1¼" thru 1", Arr. for Mtr. 1-Set Angle Cutters
Planer, 24"x6' NILES, 1-Hd., Belt Dr.
24"x12' CHANDLER, 2-Hds. Belt Dr.
30"x10' DETRICK & HARVEY—Open Side, 1-Hd. Belt Dr.
32"x10' NILES, 2-Hds. Belt Dr.
36"x8' GLEASON, 2-Hds. Belt Dr.
Blanking Press, No. 30-A BLISS, Grd., 2" Str., Bet. Uprights 24", Arr. for Mtr.
Toggle Drawing Press, No. 183 STILES-PARKER O.B.I. Dbl. Action, 2-⅜" & 5½" Strs. 26½-Tons
Triple Action Crank Press, No. 723 TOLEDO, 1½" Str. 26½-Tons, Nearly New
No. 4 LEFFLER O.B.I., 6½" Die Space, 2½" Str. 18-Tons
No. 7 WATERBURY - FARREL Solid Back, 7½" Die Space, 1½" Str. 56-Tons, Automatic Roll Feed.
No. 18 BLISS O.B.I., 1" Str. 1-¼" Shaft, Mtr. Single Phase 220 Volt
No. DA51 FERRACUTE Straight Side Dbl. Acting, ⅜" and 1/16" Strs. 22-Tons, Spinning Att. on Plunger, Shaft 2½". (Used in making watches)
No. 127-B ZEH & HAHNEMANN Dbl. Crank ⅜" Shaft, 49" bet. uprights, 2" str. Grd.
Wheel Press, 150-Ton CALDWELL, 48" Bet. Bars, Belt Dr.
Shear, QUICKWORK, 60" Throat, 18 Ga., Belt Dr.
PETTINGELL 42" Throat, Cap. 14 Ga., B.D.
No. 107 BLISS-STILES, 18" Throat, Cap.16G
Circle Shear, NIAGARA, 16 Ga., Throats 12" & 18", Belt Dr.
Splitting Shear, BUFFALO Hand Bench, Cap. 3/16".
Band Saw, 9" HOUGHTON & RICHARDS Saw, for Metal, Cap. 9x9"
Racine Jr. 6"x6", Belt Dr.
PEERLESS 6"x6", Belt Dr.
PEERLESS 13"x16", Belt Dr., Sgl. Speed
ATKINS 8"x8", Kwik-Kut, Swivel Vise, B.D.
Shaper, 24" CINC., Bk. Grd. Crank, Cone Dr.
15" SMITH & MILLS, Pl. (not Bk. Grd.), Cone Dr.
Tapping Machine, No. 1 GARVIN, Belt Dr., ¼" Cap.
Tapping Machine, No. 2 GARVIN, Arr. for Mtr., Cap. ¼" to ⅝".
Eight-in-one Planing Mill Special, PARKS, Band, Rip, Crosscut Saws, Swing, 12" Jointer, Tenoner, Mortiser, Shaper, Sander, A. C. Mtr. & Belt Sgl. Ph.
Band Saw, 36" FAY & EGAN, Table 30"x 34", Belt Dr.
Punch & Shear, No. 52 BELOIT Combined Pwr., ⅜"x2", AC. Mtr. Dr.

The Norton-Broadway Machinery Co.

610 Baymiller St., - Cincinnati, Ohio



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2—53" COLBURN, Motor Drive
1—60" COLBURN, Motor Drive
1—90" NILES-BEMENT-POND

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1—22" BARNES Sliding Head
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1—6' NILES Plain
1—6' BAUSCH Plain
1—6' WESTERN Plain

GRINDERS
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1—No. 9 CINCINNATI Internal
1—No. 10 B & S Cylindrical
1—No. 2 B & S Surface

GEAR CUTTERS
1—No. 13 B & S Spur & Bevel
1—48" G & E Spur & Bevel

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1—20"x8' AMERCAN, q.c.g.
1—21"x10' LeBLOND q.c.g.
1—30"x12' LeBLOND q.c.g.
1—36"x12' LODGE & SHIPLEY
1—PUTNAM Axle, 2 carriages

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1—No. 2 CLEVELAND Universal
1—No. 9 NILES Vertical
2—32"x30"x10' NEWTON Slab

SLOTTERS & SHAPERS
1—10" Bement
1—12" Bement
1—12" Newton

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19"x8' Sidney Q. C. Gr. Cone Hd. L.
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Hardinge Bros. Pre. Bench Lathe
Rockford Dbl. End Hydraulic, m.d.
1½" Landis Dbl. Bolt Cutter, b.d.
2" Landis Dbl. Bolt Cutter, b.d.
3" Landis Sgle. Bolt Cut., leadscrew
C-13H Natco Hydraulic Mult. Drill
No. 13 NATCO Drill with tapp. att.
No. 14 NATCO Drill with tapp. att.
No. 14 Natco 16x24 Multiple Drill
No. 30 NATCO 24x40 Multiple Drill
No. 40 Natco Straight Line Mult.Drill
No. 60 NATCO 3-Way Mult. Drill
3' Carlton Sensitive Radial Drill
4' Hammond Sensitive Radial
6' Prentice Plain Radial, cone dr.
Avey No. 3 Dbl. Spdle. Horiz. Drill
No. 14 Colb. Hvy. Duty Drill, 2" cap.
1-D Minster Hvy. Duty Drill, comp. tbl., 2" cap.
D-2 Colb. Hvy. Duty Drill, 2½" cap.
Rowbottom Cam Cutting Machine
No. 6 Jackson Die Sink. Machine
No. 4 B&S Auto. Gear Cutter
No. 400 Curtis Oil Extractor
No. 304A Oster Pipe Machine
Ingersol Tub Type Face Mill Grdr.
12x48 Queen City Pl. Grinder, self contained
12x48 Cincinnati Pl. Gdr., with c/s.
Sellers Drill Grinder, t&l. pul. dr.
No. 251-W New Barrett M.D. Centrifugal Washer

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DETROIT, MICHIGAN

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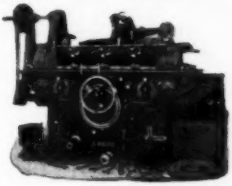

SURFACE GRINDERS

1—No. 16 Blanchard
3—14" Model "B" Pratt & Whitney Vert.
1—14" Pratt & Whitney Vert.
1—No. 200 Heald Rotary
1—No. 255 Heald Rotary
1—No. 25 Heald Rotary
1—8" Person-Arter Rotary
1—Model "H" Diamond Hyd., 16"x 12"x72"
1—No. 5 Diamond
1—No. 6 Diamond
1—Osterholm Horizontal
1—84" Safety Face
1—156" Knife Grinder
1—74-50 Bridgeport H.D. Knife
1—No. 96 30" Gardner Face
3—84" Diamond Face

INTERNAL GRINDERS

1—No. 10 Bryant
2—No. 18 Bryant
3—No. 6 Semi-Automatic Bryant
2—No. 55 Heald
1—No. 60 Heald
1—No. 65 Heald
1—No. 70 Heald
1—No. 72 Heald
1—Churchill-Morgan
1—No. 23 Baxter & Whitney

PLAIN CYLINDRICAL GRINDERS

2—6"x32" Norton
1—6"x18" Landis
2—8"x18" Cincinnati
1—10"x36" Landis, camshaft
7—10"x24" Landis
2—10"x36" Norton
2—10"x48" Norton, Model A
2—10"x36" Norton, cam
1—14"x48" Norton, Type A
1—16"x32" Landis, crank pin

PLAIN CYLINDRICAL GRINDERS (Cont.)

1—16"x42" Landis, Hyd. pin
1—16"x68" Landis, crank pin
1—24"x96" Landis
5—No. 132 Arter Automatic

UNIVERSAL CYLINDRICAL GRINDERS

1—No. 2 Bath
1—10"x36" self cont. Thompson
1—12"x24" Cincinnati
1—12"x36" N.B.P.
1—24"x144" Landis

DISC GRINDERS

3—No. 2 Gardner D. E.
1—No. 1 Gardner D. E.
1—No. 6 Gardner D. E.
3—No. 41-20" Besly D. E.
1—No. 84-16" Gardner D. E.
1—No. 26 Besly D. E.
1—No. 6 Besly D. E.
1—No. 50 Gardner S. E.
1—No. 51 Besly D. E.
1—No. 8 Badger S. E.
1—No. 6 Diamond D. E.
2—No. 8DA Hisey Wolf D. E.
1—12" Gorton 6C S. E.
1—No. 14 Gardner Opposed
1—No. 27 Gardner Opposed
1—No. 84-A Gardner Opposed
1—No. 123 Gardner Opposed
1—36" Discs—Standard Opposed

MISCELLANEOUS GRINDERS

2—LaPointe Broach
2—12-Spindle Defiance Valve
1—Type 3 2-spindle Cock
1—36" Ingersoll Tub Type
2—24" Ingersoll Tub Type
2—Gisholt Tub Type
1—Grand Rapids Tap

All machines are available for inspection in our Chicago stock.

LOUIS E. EMERMAN & CO.

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MOSER'S HIGH GRADE TOOLS

No. 3-A W.&S. Turret Lathe, chuck work, M.D.
No. 2-B Foster Univ. Turret Lathe, chuck work, M.D.
3" Rochester Table Type Boring Bar, enclosed head, single pulley drive
Oliver Arc Face Mill Grinder, 24" cap.
No. 2 Brown & Sharpe Surface Grinder
No. 2 Landis Universal Grinder
No. 3 Kempsmith Plain Miller
12"x6' American Q.C.G. Lathe, D.B.G., collets, chucks, taper attachment
14"x6' Davis Q.C.G. Lathe, countershaft, M.D.
20"x12' Hendey Q.C.G. Lathe, taper att., pan bed, M.D.
No. 3 Adams Gear Hobber
2—No. 2 Avey Single Spindle Drills
No. 2 Leland-Gifford Single Spindle Drill
No. 2A High Speed Hammer, m.d.
No. 130 Pexto Foot Operated Squaring Shear
National Oil Separator, 2 bu., M.D.

MOSER MACHINE TOOL SALES — 1608 W. Clybourn St., Milwaukee, Wis.

MACHINE TOOLS FOR SALE

1—28"x12' SCHUMACHER & BOYE ENGINE LATHE, cone drive, quick change gears, double back geared

1—21"x10' LEBLOND heavy duty engine lathe, cone drive, double friction back geared, quick change gears, arranged for m.d.

2—26" LIBBY Universal turret lathes, 7½" hole through spindle

1—26" INTERNATIONAL LIBBY turret lathe, 7½" hole through spindle

1—3A Warner & Swasey Hexagon hollow universal turret lathe, serial 109,000, all power feeds, arranged for chucking work, hole through spindle 3¾"

1—No. 5 Foster all geared head screw machine, s.p.d., arranged for bar work, bar capacity 1 13/16"

1—2¼"x11" CINCINNATI ACME screw machine, c.p. drive, friction geared head, automatic chuck capacity 2¼"

1—1½"x9" CINCINNATI ACME SCREW MACHINE, friction geared head, c.p.d., automatic chuck capacity 1½"

1—No. 2 Warner & Swasey screw machine, s.p.d., arranged for motor drive, with motor in the base, chuck capacity 1"

2—24" Steinle Universal turret lathes, all geared head, s.p.d., arranged for chucking work, hole through spindle 6¼"

1—No. 6 Defiance Horizontal boring mill, table type, s.p.d. through gear box, dia. of spindle 4½"

1—No. 1 Kearney & Trecker (Milwaukee) Plain Milling machine, s.p.d. all geared feeds and speeds, table surface 37½"x9½"

1—32"x22"x10 Ft. Ingersoll Planer type milling machine, fixed rail with 2 horizontal spindles and one vertical spindle, m.d.

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1—No. 11 BROWN & SHARPE PLAIN CYLINDRICAL GRINDER, 3 motor drive, with 220 V., 60 Cy. 3 ph. motor, max. swing 6", grinding length 32"

1—12x36" CINCINNATI Universal grinder, 3 motor drive, with motors, max. dia. to be ground 12", max. grinding length 36"

1—20" Rockford Shaper, s.p.d. through gear box

1—No. 3 Thiel Combined Filing and Sawing Machine.

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QUICK DELIVERY FOR YOUR IMMEDIATE NEEDS!

AUTOMATIC SCREW MACHS.
Cleveland, ¼", 1¼", 2" & 2¾" Model B; 4¼" Gridley; No. 1, 2, 3 Manville

BORING MILLS—VERT.
72" 24" & 36" Bullard; 30" and 72" Colburn rapid traverse vert.; 50" Bullard, 2 hds.; 42", 52" & 60" Niles

BORING MILLS—HORIZ.
No. 300 G. & L. 4⅛" bar; 12" Niles Cyl. Dble. End 7" Bar Putnam-table type; 3" Lamber; 2¼" Cleveland

BRAKES, CHGO. STEEL
Hand—3'16, 4'12, 4'16, 6'16, 8'18, 8'16, 8'14, 10'14
Box & Pan—4', 5' 14 ga.
Power—Apron Type—10' ¾"—12' ¼" 12' 3/16"—10' 10 ga.—8'12—6' 10

IRONWORKERS, UNIVERSAL
Pels No. 16; Oeking 6x6x⅞
Smith No. 91-16, notching att.
Smith No. 91-13, 4"x4"x⅞"

BOARD DROP HAMMERS
1200 lbs. B.&S.; 800 lb.W.&W. 800 lbs. and 1000 lbs. Bliss

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Geared Head Lathes; 16"x8 Ft., Walcott 20"x10 Ft. 22x44x14 Ft. McCabe Dble. Spindle Bridgeford 26"x9 ft. and 32"x 16 ft. G.H. 15 speeds
16"x6 ft. Hendey-Yoke Hd. 15" 8 Ft. Sebastian Motor in base
20"x10 & 22x12 Ft. L & S; 20x 15' Lehman G. H.; 20x10 Prentice
21x10 & 21x14' Ryerson G.H.
26"x16' & 24"x12' Bradford
25x20' Sidney; 36x14' Springfield; 36x16' S. & B; 52x22' Fifield; 18'x36x7' Putnam
Am. Grd. Hd. 18x8; No. 9 LeBlond Multi-cut.; 16x8 Bradford; 18x6 P. & W; 30x18, L & S 18"x10' Grd. Hd. M.D. 30' Pit Lathe
20x12 Ft. Monarch Gap Lathe

LATHES—TURRET
Warner & S.—No. 1-A, No. 4, No. 2 & 2-A, No. 6; No. 2-B Foster; No. 4 B. & O.
Warner & Swasey No. 2-A
28"&24" Gisholt; 28" Pond

MILLERS
UNIV. No. 3 B. & S. No. 4 Cin. No. 2 Kemps.; No. 4 Becker; No. 3-GH Hendey; No. 1½ LeBlond
VERT.—No. 6 & 5-C Becker
PLAIN No. 1 & No. 1-B, No. 2-B & 3-B K & T; No. 3-S CIN. B. & S. No. 2-B; No. 4 & No. 5 LeBlond, S.P.D.

PLANERS

10x10x30 Ft. Niles, four heads

36"x48"x12' D. & H. Openside; 20 Ft. Niles Plate Planer 36x36x10 Ft. American
22"x20x5 Ft. Pond
30"x30"x6' Gray; 26x8 openside Cincinnati; 60x60x18 Ft. Pond; 30"x30"x10 ft.; Am. 36x36x14 Ft. Detrick & Harvey with side head; 36x36x8 ft. Niles; 30x30x10 Ft. Dustin

PRESSES, HORN
Bliss Nos. 39, 40, 21, 83, No. 4-A Toledo Nos. 14, 42, 41A, 43B

PRESSES, OB.I.
Nos. 1, 2, 3, 4, Bliss No. 5, 6, No. 6 & No. 7 Toledo; No. 5 Mich.
No. 4 V&O—7" stroke; M.D. No. 7 Perkins

ROLLS
Wickes, Pyramid Type, with mtr., Drop End Housing, sizes—18' x1"; 8 ft. ¼" Bertsch
10 Ft. Wickes Vert. 1½" cap.
10 Ft. Initial type 1" cap.
6' Beloit, 3/16" cap. m.d.; 10 ft. Pyr. type 12" top, 9" bottom rolls

NEWBOLD PLATE LEVELLER AND STRAIGHTENER
96" wide; 13 rolls and 2 pinch. Motor drive with 75 H.P. A.C. motor

PRESSES, Double Crank

Clearing Crankless 4-Point Suspension Type Triple Action Press
All Steel Frame Construction—Self Contained Motor Drive—
All Gears Enclosed, 84"x133" bed; Stroke of plunger 28"

Hamilton, No. 6010—tie rod 10¼" shaft
(3) No. 6-D Bliss 12" strk.; 36"x60" bed Air Cush.
(2) No. 153-C Bliss, 8" str. 34"x48" bed; 48" ht. die space. Air Cushion;
(3) No. 154-G. Bliss, 12" stroke; 46" x 84" bed; Air Cushion;
No. 94-G Toledo 8" stroke, 42"x84" bed; Air Cush.
No. 158-B Cleveland 11" shaft; 72" betw. housings
No. 80½ Bliss; No. 4⅜ Bliss
No. 93-C Toledo 5" stroke, 34"x48" bed;
No. 94-C Toledo 5" stroke
No. 154-F Cleveland, 6" shaft—Bed 50"x72"
No. 23—J Bliss Gap Frame —6" str. 4" shaft
No. 206-B Toledo Gap Frame —6" str. 48" betw.

PRESSES, Straight Side
No. 80½ Bliss—32" str. M.D., Tie Rod; No. 56 Bliss Cons.
No. 4019 Hamilton 800 ton
Bliss, No. 78½, 24" stroke
No. 73½, No. 74½
Toledo—No. 55, No. 57 & No. DG-56 Ferracute
No. 305 Bliss—6" st. (3)
No. 3 Billings & Spenc. Trim. Pr.

PRESSES, Toggle
Bliss Nos. 5, 1½; Toledo No. 164 & 165 & No. 268¼C Toledo, 97" betw hous. bed 60"x96" — stroke of plunger 29"; No. 409 Bliss 108" betw. upr. Plunger str. 31" No. 99 Stoll

EXCEPTIONAL TOOLS
Grinder—Centerless — No. 2 Cincinnati
Grinder, Surface; No. 16 Blanchard
Grinder—Cyl. No. 25 Landis 12"x144"
Plate, Planer—20 Ft. Niles
Press, Coining—800 ton Tol.

RADIAL DRILLS
American 2½, 4', 5', 6'; West.6' 3' & 6' Fosdick

ROLLER DIE MACHINES
4, 5 & 7 Spindle Yoder

ROLLER LEVELLERS
McKay 60"-66"-48"-38"-96"

ALLIANCE BENDING ROLLS
1—30 Ft. Long Dia. top roll 26"—lower rolls 20" each—Drop end housing — hydraulically controlled—motor drive —Estimated weight 640,000 lbs.
1—20 Ft. Long — similar construction

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30' Birdsboro Hydraulic Power Press Brake or Forming Press; Capacity approx. ½" plate
Ohl 10' 10 ga.; Clearing 10' ¼"; 5' 14 ga.; No. 255 & 355 Chgo. St.; Poorman 10'x10ga.

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Ryerson No. 0, 1, 2 and 4

SHAPERS
G.&E., Invincible, 32", 28",24" Cin. 16"; 24" Am. & Mil. 28"

SHEARS POWER

16 Ft. Tol. ¼" cap. 15" gap

126" United Eng., 7 ga.
Cincinnati, Chicago Steel,Bertsch, Niagara, 10 Ft. 3/16".
12'14'; 6'18; 8'16; 10' Ohl ¼" cap.; 36"x3/16" Nia.
5' 10 ga.; 8'14 ga.; 48"x14 ga. Ohl.
Rotary No. 5 Quickwork ¼" cap.

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HIGH GRADE MACHINE TOOLS

ENGINE LATHES
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RADIAL DRILLS
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GEAR GENERATORS
PLANERS

Other types of machine tools.

Indianapolis Machinery & Supply Co., Inc.
1959 SOUTH MERIDIAN STREET, INDIANAPOLIS, INDIANA

AUTOMATICS
No. 33 New Britain
No. 55 National Acme

DRILLS
Cincinnati Bickford, sql. spdl.
Avey, sql. spdl.
L & G Belted 6 spindle
L & G 6 Spindle Sensitive
L & G 2 Spdl. Hyd. Cycle
L & G 4 Spindle Sensitive
4 Spindle Avey Sensitive
10 Spdl. Davenport Double Opposed

GRINDERS
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12" P & W Vert. Surface (2)
No. 6 Besly Dbl. Opposed Disc.
No. 34 Van Norman

LATHES
16"x8' Reed Prentice
18"x14' American
20"x10' Leblond, M.D. w. mtr.
9"x20' Porter Cable (8)
14"x8' Seneca Falls, M. D. with motor
20"x10' Schumacher B. & E.

LATHES, TURRET
3¼"x36" No. 3 Cinc. Acme

MILLS
Bilton No. 8 Productomatic
Bilton No. 50 Productomatic
No. 15 G Bilton Auto. Gr. (2)
No. 2 Toledo Semi-Auto.

PLANERS
48"x48"x10' D & H o.s.
42"x42"x10' D & H o.s. M.D. with motor and box table

PRESSES
Max-Ams. Dbl. Crank Gr. Pw.
Jarecki Die Try Out Screw, 2 post
25 Ton H & W

SCREW MACHINES
No. 4 B & O Hand Screw (4)
No. 1 P & W, 6 hole rd. tur.
No. 1 B & O, 6 hole rd. tur.

SHEARS
Oeking Comb. Punch & Shear
Pettingell No. 14 Sht. Mtl. Rotary (2)
Buffalo Armor Plate Bar Cut.
No. 2 Ryerson-Lennox Throatless Bevel

MISCELLANEOUS
Ingersoll Rand 25 HP Compr.
Magee Sheet Mtl. Wiring Edger (2)
Hutto 2 Spdl. Honing Mach.
Lipe 2 Spdl. Gear Chamferer
Dings Magnetic Chip Sep.
Pettingell Bumping Hammer
Quickwork 36" Dbl. Bumping Hammer
No. 1U Bethel Player Lapper
W. F. Frazer 20" disc Lapper
20 Ton Hanna Yoke Type Riv.
⅜" Hubbel Horiz. Tapper
Webster & Perk Tapper
No. 1 Garvin Tapper
Schuster ¼" Wire Straight.

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REBUILT & GUARANTEED MACHINES

BORING MILLS—horizontal:

2½" Niles Knee Type
4" Betts Knee Type

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44" Baush P. R. T., M. D.
42" NBP Standard, M.D.
42" Colburn Heavy Duty, M.D.

ENGINE LATHES:

42"x30' Johnson Geared Head
20"x14' Cisco, Geared Head
20"x14' Walcott, Geared Head
18"x 8' American, Geared Head
14"x7' Prentice, Geared Head
10"x 5' P. & W. Prod. Lathes

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36" Gould & Eberhardt, M.D.
60" Gould & Eberhardt, M.D.
72" Gould & Eberhardt, M.D., (2)
No. 12 Barber-Colman Hobbers
No. 62 Fellows Gear Shapers
No. 6 Fellows Gear Shaper
No. 3 Fellows Gear Shaper
24" Gleason Gear Planer

MILLERS:

No. 2 Van Norman, Duplex
No. C Becker Vertical M.D.
No. C-2 Becker Vertical M. D.
No. 2V P. & J. Automatic Vertical
No. 24 Brown & Sharpe Plain
No. 6 Becker Vertical
28" Cincinnati, Semi-Automatic
24" Cincinnati Duplex
18" Cincinnati, Duplex
37"x37"x14' Ingersoll Horiz. Slab
Carter & Hakes Lincoln Type
G. & E. Lincoln Type
Owen Duplex
P. & H. Vertical Key Seat
60" Garvin Automatic Duplex

PLANERS:

72" Morton Portable M.D.
42"x42"x13' Pond H.D., Rev. M.D.(2)
42"x42"x12' Cincinnati Rev. M.D. (2)
42"x42"x16' Pond Motor Drive
47"x40"x12' Gray M.D.
30"x30"x12' Whitc. Hvy. Duty M.D.

MISCELLANEOUS:

84" Diamond Face Grinder H. D.
48" Morton Keyway Cutter M. D.
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No. 2 Lapointe Dbl. Spindle Broach
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W. &S. No. 2-A ser. over 200,000
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4 ⅝" bar Niles-Bement-Pond; Motor Drive

MILLING MACHINES
No. 3 Davis Thompson Rotary Mill; M.D.
No. 6 Lees Bradner Thread Miller; Mtr. Dr.

LATHES
30"x17' American Geared Head; M.D.
42"x34' Schumacher & Boye Geared Head;
18"x8' Sidney Geared Head; Timken Bearing; Taper Attachment; Motor Drive
18"x8' Reed; Motor Drive
36"-60" Harrington Sliding Bed Gap Lathe; length of bed, closed 16'; open 23'; B.D.
30"x18' Pond; B.D.
24"x12' Hamilton; B.D.
14"x6' Hendey; B.D.

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No. 3A Warner & Swasey Universal Geared Head; 3 ¾" dia. spindle Motor Drive
28" Gisholt; 6¼" dia. spdl. Motor Drive
3"x36" Jones & Lamson Double Spdle.; M.D.

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3-spindle Sipp Drill Press; Motor Drive
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72" Ruesch Gear Cutter

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No. 1 Baush Multiple
No. 3 Baush Multiple
5' Western Plain
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8' Western heavy.

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No. 4-48" Brown & Sharpe.
No. 5-48" Brown & Sharpe
No. 6-72" Brown & Sharpe.
No. 6-A-72" Cincinnati.
96" Newton Spur Gear
Nos. 6, 61, 62 Fellows
No. 36-BM G. & E. Bevel Rougher

GRINDERS

No. 70 Heald Internal
No. 2½ Universal (Bath type).
10"x36" Thompson Universal
No. 4-12"x66" Landis Universal.
No. 5 Springfield Planer Surface
No. 2-18" Gardner Disc

MFG. LATHES

3½"x36" Fitchburg Lo-Swing.
3½"x60" Fitchburg Lo-Swing.
3½"x108" Fitchburg Lo-Swing.
8"x60" Fitchburg Lo-Swing.
No. 4-AC LeBlond Auto. Crankshaft

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18"x6' Bradford
18"x8' Lodge & Shipley.
24"x12' American.
24"x13' Chard.
24"x16' Lodge & Shipley.
24"x18' Lodge & Shipley.
24"x20' Lodge & Shipley, Taper.
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25"x10' LeBlond Heavy Duty.
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30"x12' Lodge & Shipley
30"x12' Whitcomb-Blaisdell
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ACS Becker Continuous Vert.
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24"x24"x6' Rockford.
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24"x24"x12' Gray.
30"x30"x8' American.
36"x36"x8', 18' Cincinnati.
36"x36"x12' American.
40"x30"x7' Gray.
42"x42"x14' Gray .
48"x48"x10' Niles-Bement-Pond
60"x48"x20' Hamilton.
72"x60"x16' American

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No. 01 V.&O., M.D.
No. 1 V.&O., M.D.
No. 303 Bliss S.S., Geared.
No. 58 Toledo Nosing.
No. 42½ Pels Beam Shear
No. 178 Toledo Toggle Drawing

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18" Dreses Fox, Chasing Bar
2¼"x26" Greenlee
3¼"x40" Greenlee
24" Steinle, 6¼" H.S.
24" Gisholt, 6¼" H.S.
26" Libby, 7½" H. S., M.D.

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36″ raised to 52″x24′ Johnson Trip. Grd. Lathe.
20″x8′ Lodge & Shipley Pat. Hd. Q.C.
14″x6′ Vernon, Cone drive, Q.C.
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2½′ Cincinnati Bickford Upright Radial Drill.
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6″x18″ Ott Plain Grinder.
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84″ Pond Vertical Boring Mill.

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Pierce 1″ capacity Bar feed & mtrzd.
5A Potter & Johnson

MISCELLANEOUS

1½″ Hayden 4 spindle Automatic Screw Machine.
2½″ Landis Bolt Cutter.
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Model W Cleveland Pch. & Shr. 60″ thrt., M.D.
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3-¾″ Hayden Five Spindle Automatic Screw Machines.
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No. 1 Norton Univ. Tool Cutter
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All Angle Grinder, Motor Dr.

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1 to 6 Spindle Allen, Avey, Leland Gifford, Belt & M.D.
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26"x16' Prentice, Grd. Head—Sgl. Pul. Dr.
24"x14' Lodge & Shipley, C.D.
20"x10' American, Q.C.G., C.D.
18"x10' LeBlond, Q.C.G., C.D.
14"x6' Rockford, Q.C.G., C.D.
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6' Carlton Fully Enclosed Head, S.P.D. Through Gear Box.

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No. 84S Bliss Stiles, M.D.
No. 2C Bliss O.B.I., Roll Fd.
No. 2R Rockford, O.B.I., Roll Fd.
No. 3 L & J, O.B.I., Roll Fd.
No. 0 L & J, O.B.I., 1" Stroke

MISCELLANEOUS
6'x6" Peerless, H.S., Hack Saw
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No. 1½ American Broach, C.D.
48" Hendley & Whittemore, Bend R1
No. 2 High Speed Hammer
No. 3A High Speed Hammer, Hvy. Duty
2" Cap. Oster Pipe Threader
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3½' Bickford Radial Drill, Gear Box.
16" x 48" Landis Crankshaft grinders.
20" Kelly Shaper, B.G. Cone.
10' Robinson Toggle press brake.
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24"x24"x6' Cincinnati planer, 1 head.
20"x10' Monarch lathe, q.c.g., cone.
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BRIDGEFORD CENTER DRIVE AXLE LATHE.
Will take up to 12"x8' axles.

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GRINDER, No. 2 Morse Univ. belt drive
GRINDER, 20"x144" Landis Plain, mtr. dr.
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LATHE, 32"x14' Lodge & Shipley, mtrzd.
LATHE, 19"x8' Sidney, motorized
HAMMER, No. 1B Nazel, cap. 2"x2", m.d.
HAMMER, 1100 lb. NBP Steam Forging
HAMMER, 2000 lb. Chambersb. Steam Forg.
PLANER, 72"x60"x15' Betts, 2 hds., mtr.dr.
PLANER, 48"x60"x14' D.&H. Opens., b. d.
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MILLER, No. 4 LeBlond Univ. table 17½x60
MILLER, Osterlein Univ. 25"x7½"x18"
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20" Lever, Wheel & Lever and Power Feed.
24" and 28" sliding head, back gear, power feed.
Bausch Multiple 16 spindle No. 1 Morse Taper.
4 spindle Foote-Burt, heavy duty.
6 spindle Hole Hog No. 1 Morse Taper, power fd.
1, 2 and 4 spindle high speed 8" overhang.
5' Bausch Radial Drill.
59 other drills of various sizes and types.

MISCELLANEOUS

Brake, Robinson, toggle, 5'.
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Lathe, 28"x20'. 6" Rahn Carpenter, with rais. blocks.
Milling Machine, No. 4 Burke.
Milling Machine, 20"x20"x8' Ingersoll Slab, m. d.
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Shaper, 24" G & E, back geared crank.
Turret Lathe, No. 4 Bardons & Oliver, chuck. equip.
Turret Lathe, 2¼" J. & L., cross slide head.
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16" Cincinnati
20" Steptoe

DRILLS
3' Cincinnati Bickford Rad.
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MISCELLANEOUS
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No. 1 LeBlond Univ. Tool & Cutter, Power Feed.
Cleveland Relief, M. D.
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No. 1 Foster Hand.

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No. 2 P & W Hand.
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Die Filer, No. 5 Thiel, m. d.
Gear Cut, No. 3—26"—B. & S.
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20" Barnes
20" Superior Upright
½" Commander Electric
½" Utility, Electric
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24" Aurora
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3' American Radial (2) sens.
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Bausch Multiple, 8-spindle

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No. 2 Cincinnati Plain
Thompson Grinder, Universal
No. 2 Brown & Sharpe Surf.
No. 1 Landis Universal
10"x36" Norton Plain Cyl.

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No. 2 Kempsmith Universal
No. 2 Kempsmith Plain
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Oesterlein Plain (2)
No. 1½ Fox
No. 3½ Fox
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21" Gisholt (2)
24" Gisholt
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8" Gleason Bevel Gear Generators (2)
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21" Gisholt turret lathes
21"x10' LeBlond—Production
24x8 Sch-Boye, Q.C.G. T.A.
27x16' Bridgeford—S.P.D.

MILLING MACHINES
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No. 3B K & T Plain; S.P.D.

SHAPERS
24" Walcott, Helical Gear
24" Ohio, B.G. Single P.D.

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21" Gisholt turret lathe
2A W. & S., Cone Dr.

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GRINDERS—P & W 12" vert. surf.; Cin. No. 1½ & B & S No. 12 univ. tool, B & S Nos. 11&16 pl. ; B & S No. 2 and Abrasive No. 33 Surf. Heald Nos. 60 & 65 Int.; Landis 10x30" Plain; B & S 10x48"; 3—Norton 6x32" plain; badger No. 220, auto. d. e., opposed disc (4); Norton 10" x 36". Diamond No. 2 Auto. Surf.

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KEYSEATERS—Mitts & Merrill No. 5 vert. Davis No. 1; M. & M. No.0; M. & M. No. 2.

LATHES—Monarch 16"x10' M.D.; Lehmann 18"x9'; Amer. 22x8'; Davis 22"x10'; L & S 20"x10'; S-B & E 20"x10' q. c. g; Flather 22"x10'; LeBlond 16"x8'; Gleason 45"x12'; Monarch 16"x8' (2); Ryerson 20x10', m.d.; S.B.E. 30"x12' Q.C.G. Hendey 16"x8' C.H.; Hendey 16"x10' grd. hd.; Sidney 18"x8' and Flather 16"x8'.

MILLING MACHINES—Ohio No. 29, Ohio No. 20, Cin. No. 3, Hendey No. 3, B & S No. 3, LeBlond No. 3H, Cinc. No. 1 s.p.d. Plain; LeBlond No. 4 M.D. C.D. & Cleveland; No. 2 s.p.d. Plain Cinc. 24' Auto. Plain; Model "B" Vertical; Owen Duplex; Ingersoll M.D. Slab Miller 4 hds.; Newton Vert. with rotary table; Becker No. 2 Vert.

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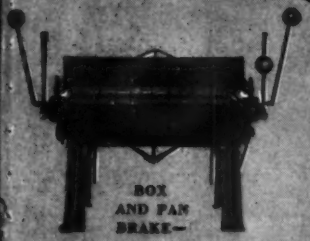

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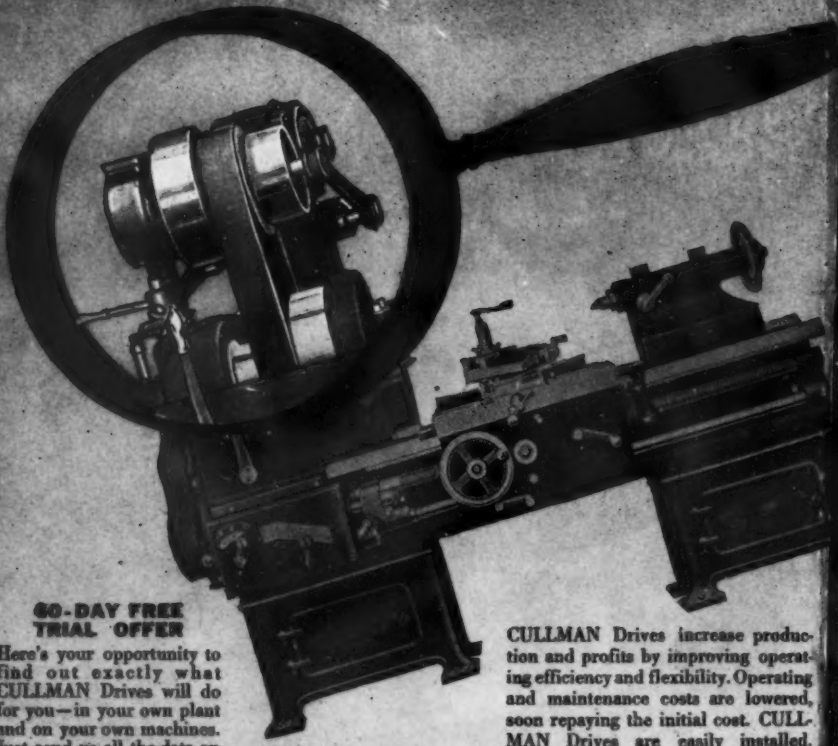

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